THE SOUTHERN FOREST RANGERS COLLEGE MAGAZINE

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The Southern Forest Rangers College Magazine

Vol. 40 ANNUAL 1964

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Cover 1952 Bombax Ceba Plantation of Aiyrangavu Range, Kerala State, By H. Rajagopal Shetty.

Back Cover By Arsal Won Second Prize in the College Photographic Competition.

THE SOUTHERN FOREST RANGERS COLLEGE MAGAZINE

Vol. 40 ANNUAL 1964

ABOUT OURSELVES

1962 — '64 RANGERS COURSE :

Out of the total strength of 111, one student from Madras state was under medical treatment and did not join ... econd year course. The statewise particulars of students are: Andhra P... ans — 1. Madras — 4, Maharashtra — 20. Mysore — 20, G... Madhya Pradesh — 42. Ceylone sent 2 candidates under Colon...

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1963 — '65 RANGERS COURSE :

Out of 105 students joined the College, one student deputed by the Gujarath state subsequently was selected for the Indian Forest College, Dehra Dun, and another had to be withdrawn on medical grounds. The following are the statewise particulars: Andhra Pradesh — 4, Madras — 7, Maharashtra — 15. Gujarath — 12, Mysore — 4, Madhya Pradesh — 43, Orissa Forest Corporation — 10 and Goa — 5. Malaysia sent one and Thailand two under Colombo Plan.

TOURS : (SENIORS) :

The first tour included Allapalli, Nagri, Agra, Dehra Dun, Delhi and Madras camps lasting from 18—1—1964 to 26—2—1964. The second tour commenced on 12—4—1964 and ended on 22—5—1964. The camps were Nilambur, Watekolly, Mysore, Bandipur and Ootacamund. The third tour was from 4—7—1964 to 1—7—1964 covering Bangalore and Tirupattur camps. Students underwent a three week course in Field Engineeriag and Weapon Training at the Madras Engineer Group and Centre, Bangalore.

JUNIORS :

The first tour (21—1—1964 to 20—2—1964) consisted of Topslip, Sadivayal and Bennari camps. The second tour (16—4—1964 to 22—5—1964) included Kodaikanal, Gudalur, Kanyakumari and Punalur camps. The last tour for the year from 4—7—1964 to 25—5—1964 covered Trichirapalli, Neyveli and Chingleput camps.

CONVOCATION :

The annual Convocation was held on 31st October, 1964. Shri M, Bhaktavatsalam, Chief minister of Madras state, presided and distributed certificates and prizes. Detailed proceedings appear elsewhere in this issue.

ANNUAL ATHLETIC SPORTS :

Annual Athletic Sports was held on 11—1—1954. Wing Commander J. W. Fenn, Station Commandar, Air Force Station, Sulur, Coimbatore, presided

and Srimathi J. W. Fenn distributed the prizes to the winners. The Championship Cup was won by Sri R. K. Ghana of the 1963–'65 Rangers Course deputed by the Orissa Forest Corporation.

MARATHON RACE :

The Marathon race of this College extending over a distance of about 7 miles was run by students on 21-3-1964. Sri V. Sambasivam of the 1963-65 Rangers Course from madras State came first in the race.

THE COIMBATORE INTERCOLLEGIATE SPORTS :

In rhe intercollegiate sports Sri R. K. Ghana won the championship.

THE COIMBATORE INTERCOLLEGIATE DRAMATIC COMPETITION :

In the intetcollegiate dramatic competition held under the auspicious of the Lions Club of Coimbatore at the Savitha Hall on the 28th and 29th of November 1964, our college took part and presented the drama " THE EYES ". Sri P. K. Mohanty was awarded the best actor prize.

FOREST COLLEGE ESTATE :

Due to national emergency proposals for new buildings, ordinary repairs, etc. had been postponed. However, the construction of a compound wall around the estate in a phased programme had been carried out.

COLLEGE STAFF :

1. Sri K. M. Guruswamy Gounder, Assistans Instructor, was reverted back to Madras state on 1—4—1964.

2. Sri V. K. Karunakaran Nair proceeded on leave from 1—5—1964 and on expiry of leave reverted back to Madras state.

3. Sri T. Rajamannar from Andhra Pradesh joined as Assistant Instructor on 12—6—1964.

4. Sri V. Rangamani from Madras state joined as Assistant Instructor on 16—10—1964.

— *EDITOR.*

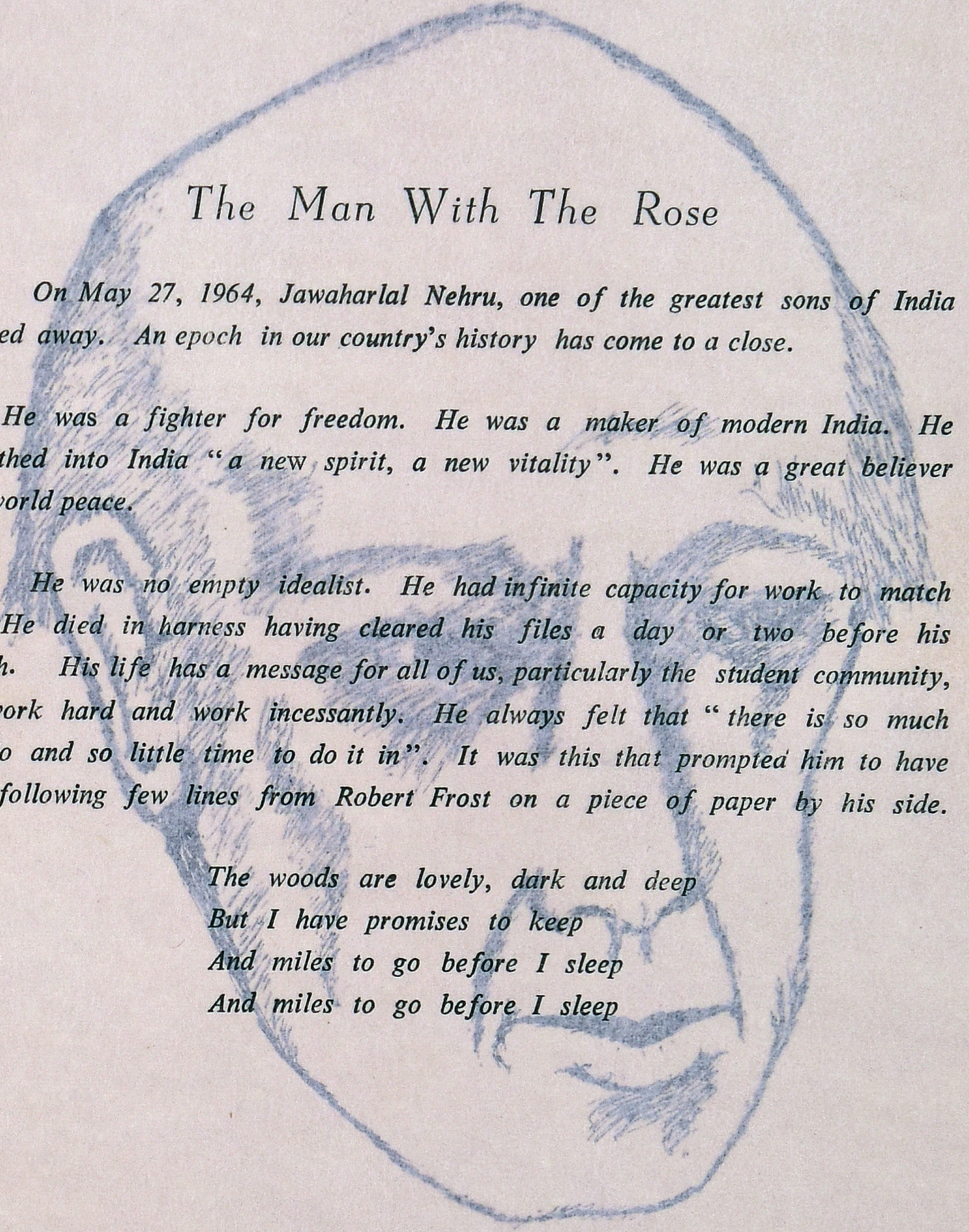
The Man With The Rose

On May 27, 1964, Jawaharlal Nehru, one of the greatest sons of India passed away. An epoch in our country's history has come to a close.

He was a fighter for freedom. He was a maker of modern India. He breathed into India "a new spirit, a new vitality". He was a great believer in world peace.

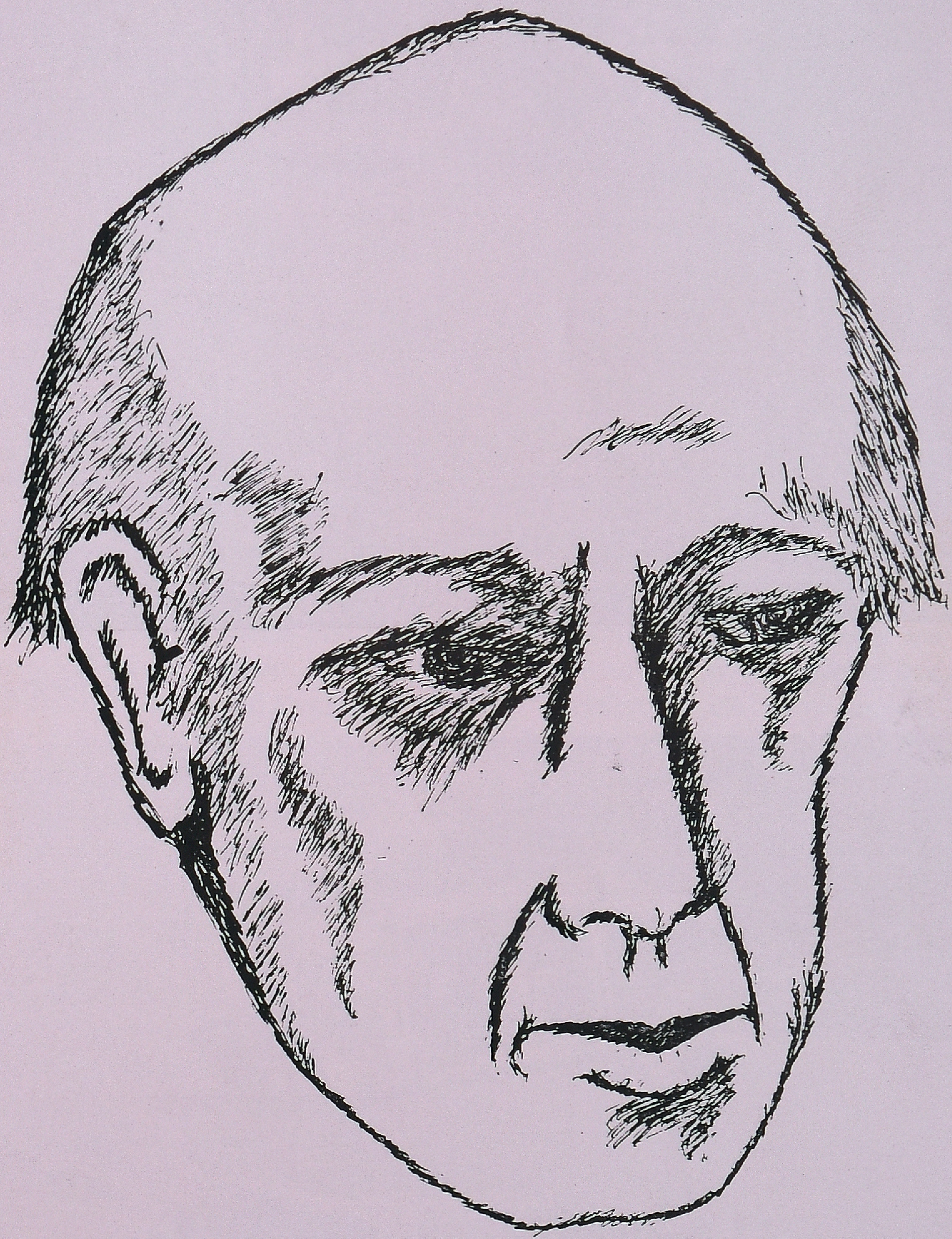
He was no empty idealist. He had infinite capacity for work to match it. He died in harness having cleared his files a day or two before his death. His life has a message for all of us, particularly the student community, to work hard and work incessantly. He always felt that "there is so much to do and so little time to do it in". It was this that prompted him to have the following few lines from Robert Frost on a piece of paper by his side.

The woods are lovely, dark and deep
But I have promises to keep
And miles to go before I sleep
And miles to go before I sleep



— Sketch By P. K. Mohanty.

"Combined a fine sensitivity of mind, a rare delicacy of feeling, with large and generous impulses".



— Sketch By P. K. Mohanty.

" Combined a fine sensitivity of mind, a rare delicacy of feeling, with large and generous impulses ".

TRIP TO PERIYAR GAME SANCTUARY

— H. Rajagopal Shetty.

— H. Rajagopal Shetty.

The lesser known evergreen Forests of South India

K. SHANMUGANATHAN, M. A., A. I. F. C.
Instructor, Southern Forest Rangers College.

The Southern Tropical Wet Evergreen Forests, wiih a multistoried crop of great density, containing gigantic trees of towering heights and massive girth projecting well above in the top canopies are too well known to students of forestry to warrant any special mention. These forests are also popularly referred to as the "Rain forests", because of the very heavy rainfall (250 cms. to 1000 cms. annually) that is precipitated in the tracts where much forests are situated. They are located on the windward side of the Western Ghats and though there is a prounced break of fairly long duration of the rainy seasons, the fairly high percentage of relative humidity with which the atmosphere is charged in such localities is also a contributory factor leading on to the evergreen nature of these forests, and in maintaining them in such condition. The water shed line clearly demarcated these Evergreen forests from the Moist to dry deciduous forests that are met with on the leeward side of the hills. Transgression of deciduous forests into the zones of Evergreen is mainly caused by the influences of biotic factors. About a century back, except *Hopea parviflora*, *Mesua ferrea*, *Calophyllum tomentosum*, *Dysoxylon malabaricum*, and a few others, the rest of the innumerable tree species occuring in these evergreen forests were not commerically extracted. This led to the popular conception among the public and the Forest Officers of the early decades of this century that these forests are of commercially less importance than the moist deciduous forests, which contain teak, the king amongst timber. But subsequent demands for softwoods and the advent of Plywood manufacture have changed this outlook radically and at present almost all the tree species of these forests are extracted and utilized and these forests have assumed the same, if not greater importance than the Moist Deciduous forests. In fact, the day has now come when one is faced with the denudation and denudation of these forests and the position is made considerably worse by the somewhat inadequate knowledge of the means of

restocking these forests, when natural regeneration is found insufficient. Various methods of artificial regeneration are now attempted in some depleted areas not with any reasonable success. In fact, this lack of a safe and sure method of regenerating these forests has also led in a few places to conversion of these depleted forests to plantation of deciduous species, such as Teak. Therefore, intensive research regarding the regeneration and efficient management of these forests seems to be an immediate necessity.

The other types of evergreen forests met with in South India are :—

(i) The Southern Wet Temperate Forests.
(ii) The South Indian Dry Evergreen Forests (Carnatic Evergreen) and
(iii) The Tidal Forests.

These forests are not at present as important from the utilization point of view as the Southern Tropical Wet Evergreen Forests. But there are possibilities of improving their commercial value in due course of time, perhaps mostly by converting them by artificial regeneration methods taking advantage of the somewhat favourable conditions of rainfall, soil, that are in existaece.

These forests are described below with special reference to their floristic composition and factors of locality.

SOUTHERN WET TEMPERATE FORESTS — Shola-grassland Type :

The forests belonging to this type are found scattered in uplands at elevation from 5000′ to 8000′ on the Nilgiris, Anamalais and Palani hills of Madras and other hills in the Kerala State. The grasslands are universal and the evergreen forests occupy sheltered places in such grasslands. The forests are found to occur widely scattered, but in small pockets, especially along heads of streams in the folds of converging slopes, wrinkles, hollows and depressions caused by landslips. In general, these forests occupy zones of maximum moisture in such localities. Good and effective drainage appears to be a guiding factor, as such forests are not met with at the bottom of the valleys or in flat lands. The soil is black in colour and loose-textured with a high organic content. The dense leaf litter adds in to the already fertile soil. The average annual rain-fall is very high, varying from 100 to 750 cms., and the precipitation is well-distributed over the year. In fact, the period from January to March is perhaps, the only non-rainy part of the year. With such variation in the extent of annual precipitation, it is only natural to presume that rainfall is not a major factor

contributing to the existence of these forests. Optimum conditions of temperature and soil moisture appear to be the guiding factors, irrespective of the total rainfall. (The temperature varies from 5°C to 25°C). Frequent fires, raging over the adjoining grasslands, have probably led to a reduction in the extent of the pockets of such evergreen forests. Fire-protection measures prescribed to be followed over the past 30 years have not, however, succeeded much in aiding the extension of these evergreen belts into the grasslands (as in the North Coimbatore Division of Madras State and the Kollegal Forest Division of Mysore State), though there are very clear evidences in a few places, if the forests having occupied a much larger tract in the past than at present.

The trees found in these forests are much smaller in size while compared with those of the Southern Tropical Wet Evergreen Forest and have dense rounded crowns with coriaceous leaves. The young leaves are conspicuously red in many instances. The trees attain considerable girth, though short boled. There is also no clear differentiation into various canopy layers.

The tree species commonly met with are the following:

Gardenia obtusa, *Michelia nilagirica*, *Ternstroemia japonica Elaeocarpus* species, *Hydrocarpus alpina*, *Sideroxylon tomentosum*, *Eugenia calophyllifolia*, *E. arnottiana*, *E. montana*, *Euonymus indicus*, *Ilex wightiana*, *Eurya japonica*, *Microtropis* species, *Turpinia nepalensis*, *Cinnamomum wightii*, *Symplocos spicata*, *Meliosma wightii*, *Photonia* species, *Ligustrum* species, *Litsea wightiana*, *Rhododendron arboreum*, *Daphrinphyllum* species, *Macaranga indica*, *Celtis tetrandra*, *Garcinia cambogia*, *Mallotus*, etc., etc.

The undergrowth comprises of *Berberis tinctoria*, *Hypericum mysorense*, *Rubus* spp., *Dodonaea viscosa*, (almost a small tree in these localities), *Rhodomyrtus tomentosa*, *Osbeckia* species, *Wendlandia notoniana*, *Ixora notoniana*, *Gaultheria fragrantissima*, *Mahonia leschenaultii*, *Plectronia neilgherrensis*, *Elaeagnus* species, *Turpinia nepalensis*, *Viburnum erubescens*, etc.

The common shrubs met with in these forests are *Rosa* species, *Rubus* species, *Toddalia asiatica*, etc.

In the grass lands, *Cymbopogon polyneuros*, *Ischaemum ciliare*, *Chrysopogon wightianus*, etc., are the main varieties of grasses that grow, whiie the "Gorse" (*Ulex europaeus*) and the "Nilagiri broom" (*Cytissus scoparius*) are often found to be invading these grass lands to a large extent.

The Ecology of this shola-grass lands type in the Nilgiris has been receiving the attention of many forest officers and others for quite sometime now. Professor H. G. Champion was "inclined to think that the grassland is nowhere the climax formation though the wet hollows are probably too swampy for tree growth and would carry a peat forming sedge vegetation, and rocky sites would only carry scrub association" and considered that the sholas represented the climatic climax of the locality and the grasslands resorted resulted due to biotic interference. Mr. C. R. Ranganathan finds "it difficult to resist the conclusion that the grassland is the climatic climax over atleast a greater part of the territory which it occupies at present" and that the shola, which forms the forest climax in the plateau and that it has "overstepped its optimum habitat and entered upon a region where one or more factors continue to keep it in a state of stagnation, defence or retreat". He further feels that a time would come when such shola forest on high elevations would ultimately disappear when it loses its struggle for existence, giving place to the grassland climax. His arguments are based on evidences such as old paintings and also the firm belief that the *Todas*, the original inhabitants of the locality, "are not axemen do not practise agriculture and do not clear forests" and that these pastoral people had their mode of life "evolved by the environment in which they found themselves", and that they did not cause any biotic interference by clearing the forests. Thus in the absence of any biotic interference by the *Todas*, it is inconceivable that the grasslands are results of retrogression from the shola, considering the shola as the climax. Thus he advocates the recognition of "two fundamentally different types of vegetation, evergreen shola forest and grassland, as independant climaxes in ecological equilibrium, whose relative distribution is topographically defined".

Mr. T. Jeyadev is of opinion that "since there cannot be two climaxes within the same climate, the status of the grasslands in the plateau will have to be considered as a Pre-climax, because Ranganathan's searching study of the ecology of the locality had clearly revealed that the grassland cannot be secondary to a previously present forest climax and because factors like grazing and burning can only degrade the forest climax at most to a miserable scrub, in view of the rainfall of the locality and not permanently stabilize such a formation of grasslands over extensive areas". According to him the grasslands cannot be considered a sub-climax where the processes of succession to a climax, are halted by biotic factors as in areas where such retarding factors, are not in full play, the grasslands had held their own for a long time. He concludes that while the sholas can be the climatic climax of the locality, "it is clear that over considerable

areas where stretches of grassland had required supreme for centuries, the ecological status of such grassy patches is that of pre-climax mainly conditioned by the extent of soil moisture, exposure and frost".

Economically, these forests of the shole-grassland type are of little commercial value. The grasslands in the Nilgiris and Palni in the Madras State and elsewhere in the Mysore and Kerala States are now being planted up with other economically important tree species. While Madras State is planting up the "Bluegum" (Eucalyptus globulus) and the Wattles (Australian Acacias), Kerala has taken to very large scale planting activities on such grasslands in recent years, with Eucalyptus grandis. Mysore favours Eucalyptus hybrid in addition to E. grandis. In Madras State, even the intervening shola forests are sometimes cleared and planted up along with the adjacent grasslands. While many have raised the eyebrows and objected to such cleaning of sholas in the interests of soil conservation and maintenance of the ecological processes, many other ultra-practical forest officers have favoured such activities and attempted such work with great zeal and enthusiasm. The results will have to be watched carefully.

CARNATIC EVERGREENS:

The South Indian Dry Evergreen Forests (or the Carnatic Evergreen forests) are found scattered along the East Coast of our country from Orissa downwards upto Point Calimere ("Kodi Kadu") in the Tanjore District of Madras State. Further down South they are replaced gradually by the Carnatic Umbrella Thorn Forests, with *Acacia planifrons* as the principal species. The tracts where such forests exist receive an annual rainfall of about 75 to 100 cms. or more. Though the main showers are from the North-East Monsoon the precipitation, though not copious, is fairly well distributed. The Forests are comprised of trees of low rounded crowns with thick leaves. Unlike the Tropical Wet Evergreen forests, no district layers of canopy formation by different species or groups of species are observed in these forests. The principal species, characteristic of this type are :—

Mimusops hexandra, *Mimusops littorolis*, *Mimusops elengi*, *Memecylon edule*, *Memecylon angustifolium*, *Diospyros ebenum*, *Ixora parviflora*, *Hemicyclia sepiaria*, *Buchanania latifolia*, *Canthium didymum*, *Crataeva*, *religiosa*, *Strychnos Strychnos nux-vomica*, etc.

AMONG THE SHRUBS FOUND ARE:

Salvadora persica, Hugonia mystix, Maba buxifolia, Clerodendron inerme, Cassia auriculata, Webera corymbosa, Atalantia monophylla Carissa spinarum Scutia indica, etc.

Till date, most of the species ment oned above have not been found to be economically very useful. *Mimusops hexandra* and *Hemicyclia sepiaria* are extracted and consumed locally as firewood *Buchanania latifolia* and *Cassia auriculata* are of Minor Forest Produc importance.

Taking advantage of the somewhat favourable climatic conditions prevalent in localities where such forests occur, large tracts are being cleared in parts of Andhra Pradesh and Madras State and planted up artificially with species of greater economic values. The species so planted are *Casuarina equisetifolia, Anacardium occidentale*, *Eucalyptus* hybrid and many varieties of dry fuel species.

The Chinglepet, Cuddalore and Tiruchirapalli Forest Divisions of Madras State contain such forests. In addition these forests are also seen in the Sriharikota, islands of Nellore District and other disticts of Coastal Andh ra Pradesh and parts of the Orissa State.

TIDAL FORESTS.

These forests are those occuring below the limits of the High water level of the tides along the east coast in the estuarine areas. Such lands are frequently flooded by the salt brackish water or by the practically soft water of the rivers, when such river water is "impounded by the high tide" As a result of such frequent inundations, the alluvial silt brought by the river is repeatedly deposited in such lands and these areas in due course are often exposed during the low tides and submerged while at high tides. These forests are often referred to as "Mang rove forests" though, the true mangroves constitute only a very minor part of the individual tracts of the Tidal forests. In the lower most accretions of the build up of the soil on the banks, the Mangroves predominate, almost exclusively, but when the processes of soil building advance, the general elevation of the interior parts is gradually increased and such localities that are not subjected to tidal submergence, the "Mangroves" are replaced by other vegetation, though the soil itself is not very much different in compositon from that in the tidal zones.

The forests (including the Mangroves) are of a closed evergreen type with the trees growing to heights varying from 8 to 20 metres. The Mangroves exhibit vivipary and possess pneumetaphous and stilt roots so characteristic of them. Very often, the trees species form themselves into few groups-each group forming a different storey. The best growth is found on the ground which is submerged at every high tide with moderately brackish wtaer. The species that occupy the higher storey are :

(1) *Rhizophora mucronata* and (2) *Sonneratia apetala* which occur near the water front and *Avicennia officinalis* and *A, marina* found a little interior.

The last species however, is known to occur even along the water front (Muthupet area of Tanjavur Forest Division). The percentage of this species with reference to the general make up of tree growth, increases as one proceeds towards the interior. All these species are confined only to the inundated areas and with further depositions of silt, the conditions become adverse and even established stems develop stagheadedness and eventually die off. Of the species mentioned, only *Avicennia officinalis* is capable of coppicing to some extent.

The othes species mainly regenerate by natural means.

Younger growth of the same species along with *Aegiceras majus*, *A. corniculatum Brugeria cylindrocopsis*, *Excoecaria agallocha*, *Ceriops roxburghiana*, *Lumnitzera racemosa*, *Cynometraramiflora*, etc., form the lower canopy of tree species.

The common shrubs occurring in these forests are *Acanthus ilicifolius*, *Suaeda monoica*, *S. nudiflora* and *S. maritima*.

Fimbristylis species are the grasses and *Derris* species the climber, generally found in these forests.

Such forests are met with in the Muthupet Reserved Forests of Tanjavur Division and the Pichavaram Reserved Forests in the Guddore Division of Madras State as well as parts of Andhra Pradesh. Small patches of Mangroves are also met with in the backwaters of the Kerala State.

Ecologically, these forests may be a *seral type* (Prof. Champion), as with a rise in ground level, a low scrub jungle which is a *climatic climax* appears. Some this are of the view that this is an Edaphic climax.

USES :

Rhizophora species, *Bruguiera cylindiocopsis* and *Cerions* can possibly be developed as tanning material whereas *Avicennia* species are used at present as firewood and also in turnery works for manufacture of toys. *Sonneratia* species are used as fuel as well as planks. Match splints can be obtained from *Excoecaric agallocha.* Recent researches conducted at the Forest Research Institute have revealed that good adhesives can be mannfactured from the barks of some of these mangrove species. There are also indications that the timber of some of these species can be peeled off as veneers. But by and large, the only sp:cies now in popular demand are, *Avicennia spec:es* aud *Sonneratia apetala* that are mainly utilized as fuel, with such indications for other uses, intensive research to ascertain the best methods of regeneration exploitation and utilization appear imperative and immediate and wide publicity should follow the results of such research, so that the usefulness of these forests can be fully utilized.

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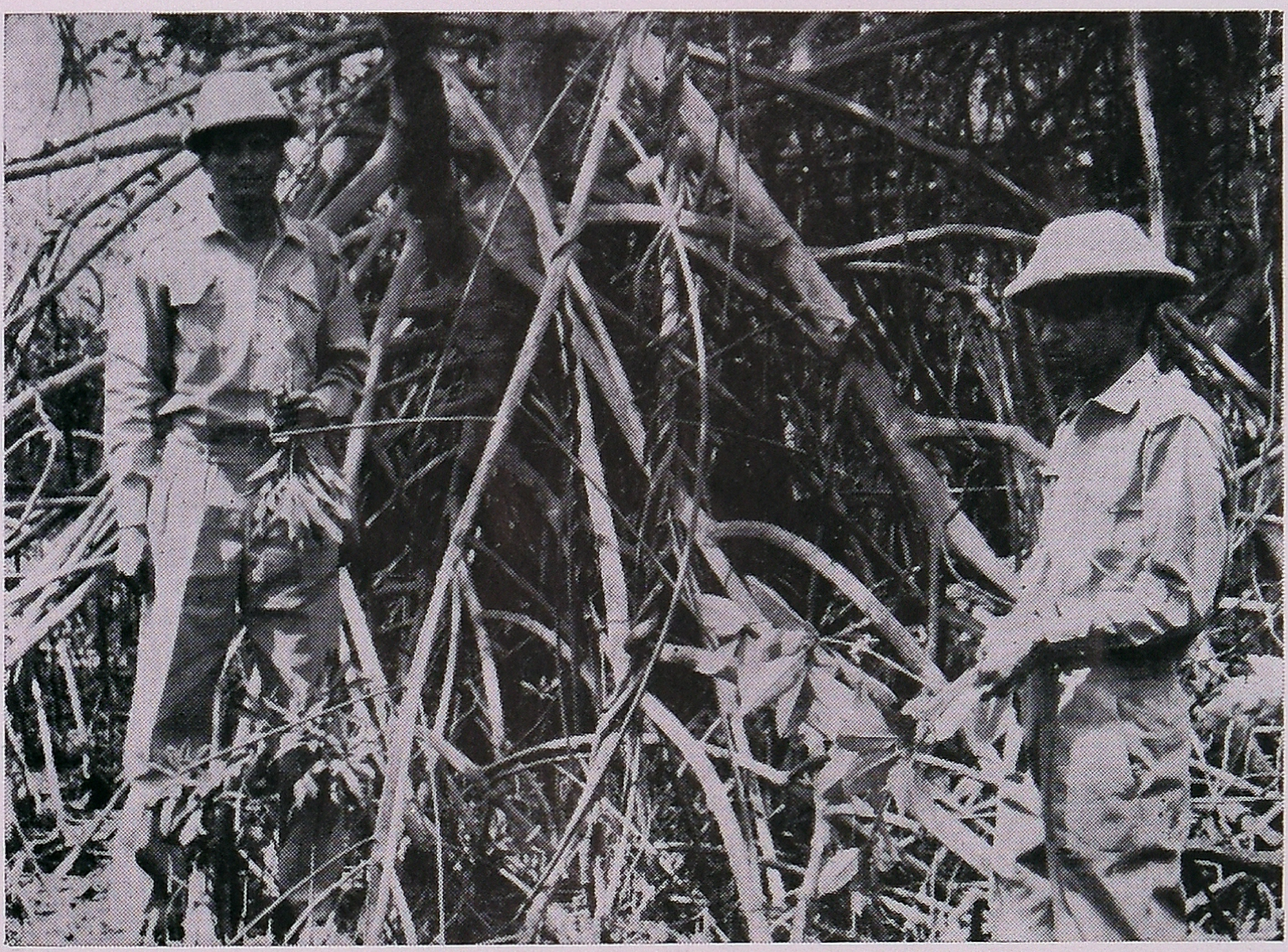


— *K. Shanmuganathan.*

Stilt roots of Rhizophora spp. — Pitchavaram reserve.

How to avoid waste in Wood Industries

KASTURI RAMACHANDRA RAO, M. E., A. M. I. S. E. ETC.

Despite modern machinery and skilled workmen wood waste continues to exist in wood workshops so that one is made to believe that such wood waste is a necessary evil and should be avoided as much as possible. The prime responsibility of a superior of the wood workshops, is to operate this department in such a manner as to allow the industry to make a profit. In modern times, due to increased competition every item of wood becomes more costly and the eliminimination of this becomes more important. In fact, even the small and otherwise unavoidable wood waste can be properly harnessed to yield products of utility by experimentation and research. The prevention and utilization of wood waste is a definite, constant obligation of the supervisor, because he has the greatest opportunity to study and control. Actually the evidence of material waste can be deducted by methods of inspection, observation and common sense.

Wood waste can be broadly divided into two main classes, one relating to the actual working aspects and the other relating to the unwanted by products as chips, saw dust, etc. Those belonging to the former type can be summarised as follows:

SUPERVISION :

At every stage of production a thorough supervision is not only desirable but necessary. The co-operation of every employee is very necessary for the smooth running of the Industry. It is not necessary that supervisory staff must not only be highly qualified for this job but should also be painstaking and considerate.

CHOICE OF MACHINERY :

Choice of machinery for various types of production is not only desirable but necessary. It is the foremost duty of the supervisor to scrutinize thoroughly the indents for machinery and get expert suggestions as regards the suitabilities of a particular machine and give credit when due.

CHOICE OF WORKMEN:

Although a right type of machinery is at hand to start with, inefficient workman will spoil it if he is not well acquainted with its working. One source of waste in the machine room is more tinkering with machines. This becomes quite a hobby with some if permitted, and nine times out of ten the machine is worse for it rather than better. Where everybody tinkers, it is always the other fellow who did the damage if any is done. It is better to appoint some one capable and can handle the machines and to maintain the responsibility keeps with him. Therefore it is suggested without skilled workmen the desirable proficiency is never achieved and the machine tends to become totally useless.

RAW MATERIAL:

Proper planning for the quality and quantity of wood should be made available if the conditions of good machinery and qualified workmen is fulfilled.

It is also necessary to obtain sufficient quantities of the raw material well in advance for smoorh running of the industry.

ACCIDENTS:

For a well established concern or institution accidents to machinery and workmen are a great loss in man hours and consequent decrease in production as well as compensation to workmen. These can be achieved by taking elaborate precautionary measures.

The second type of wood waste as already mentioned includes the saw dust and chips which are unwanted by-products in various wood working industries. To utilise these unwanted by products, it is better to collect them together from the different concerns. Although several types of decorative constructional boards from saw dust can be constructed and the author has got opportunity to prepare them even then it does not appear to be possible to effectively salvage such wood waste unless some sort of centralised wood working industries begin to operate in the country as done in other countries. The art of decorating furniture is an old one. Formerly the people particulary the rich class used to glue veneers to wood, carving of wood with chisel, etc. in order to get a new design, but such methods are very costly.

It has long been experienced that while peeling a wood log into veneers of various thicknesses in a plywood industry and in wood workshop where there is a peeling lathe waste occur. Such wastage is particularly used as a fuel with no pay return to the industry. In order to solve this problem some attempts were therefore made to glue pieces of certain woods to form a block, like a laminated wood, further more, it is very difficult to colour wood, though some attempts were also made to glue coloured wood in order to get certain patterns and designs.

The different thickhnesses of veneers such as 1/100th, 1/64th, 1/32th, 1 1/16th, 1/8th of an inch were obtained from the peeling lathe, and were glued with casein glue, for which casein fluride was made use of. Such glued veneers were cold pressed. The block so obtained may be of any thickness according to the design contemplated. After the block is ready it is sliced on the thickness side to the desired thickness which can be set in any form but usually the slices of 1/8″ thickness is commonly used. Similar procedure may be adopted for veneer strips of various colour and various thicknesses can be blended together at various angles.

The prepared slice is glued and nailed to the piece of wooden table top of frame of a box in such a way that no nail may be visible on the outer surface. The walls and floors of the room can be decorated by fixing a slice nicely. It may be pointed out that if the colour fades it would be replenished by polishing with ordinary wax.

Lastly, it remains to be seen that if this sort of work is to be adopted on a commercial basis this will not require a huge amount of money and labour excepting a few carpenters and labourers. Named as "Ranuda Product", the product eventually hopes to be commercially lucrative. This sort of workmanship can well be used in special cabins, railway coaches, libraries, receptional halls, clubs, restaurants, etc.

Fossil wood of Tiruvakkarai

H. RAJAGOPAL SHETTY,
Assistant Instructor.

Tiruvakkarai is a small village on the Banks of Shankarabharani River, in Tindivanam Taluk of South Arcot District of Madras State. It is of no great significance but for two things. The grinding stones made in this village of the dark blue hard granite locally available around here is a pass-word for top quality in this region. It is a place of pilgrimage for the students of geology because of the deposits of silicified fossil wood of Cuddalur series.

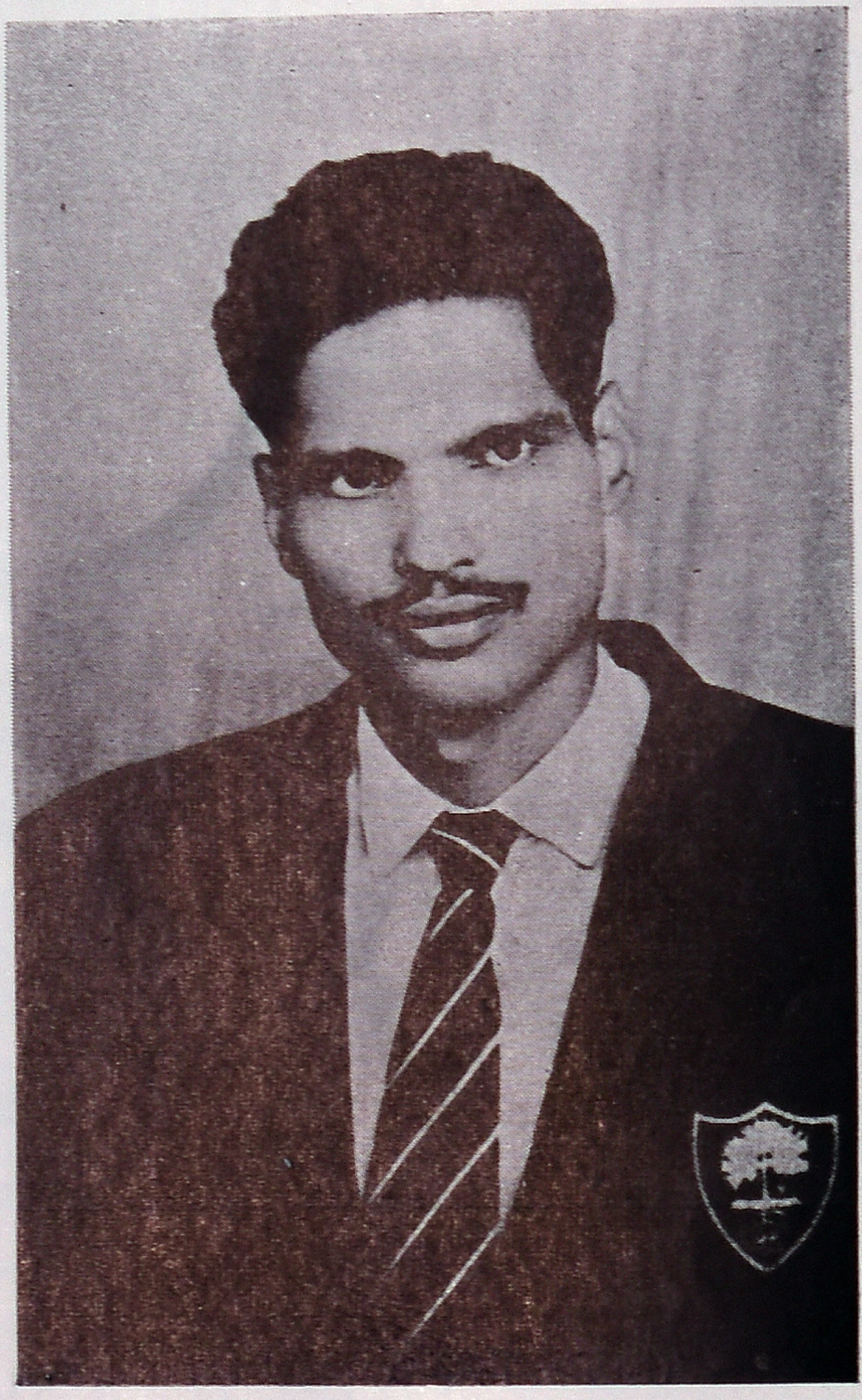
Large pieces of fossil wood are exposed on the surface at several places in this village. In fact pieces are found around the village, on the field bund, river bank and bed. A well dug here, is almost fully constructed with these fossil 'wood'. Realising the need for the preservation of these deposits, the Geological Survey of India, has fenced all the important sites in and around this village with barbed wire fencing and reinforced concrete posts. As though it is a missing link between the mythical and the modern, the villagers still narrate with due gravity that these are the remnants of broken bones of Rakshasas killed by Lord Krishna. Actually the fossils resemble the decaying bones of some monster. The enlightened few refer to the fossils as "Kallala" which means silicified Ficus trees in the broad sense.

These fossilised trees are estimated to be 20 million years old or in other words they are the contemporaries of the forest, the remains of which is now mined at Neyveli as lignite. Due to great geological upheavals, these trees got buried and immersed in siliciferous solution. Due to immense pressure ot the over burden and perhaps heat also, the silicabearing solution permeated righ- up to the core of the wood and replaced the organic materials cell by cell by silica, in a process called petrification. (These replacements can at times be by other materials like calcite, dolomite, or pyrite when we get other forms of fossils). In the fossilised wood the petrification is so spectacular that even the details of cellular structure are preserved. Annual rings, even the medullary rays can often be seen. The transformation is so complete in details it is at times hard to believe that there is nothing woody left in it.

— *H. Rajagopal Shetty.*

The fossilised tree and the author.

CHAMPION ATHLETE



R. K. GHANA (1963—'65 Course)

A study of the cell structure of these fossil wood has revealed that the species constituted some gymnosperms and a few early Angiosperms. It resembled the species of Mesembrioxylon and some of the modern Guttiferae, Celastraceae, Leguminosae and Euphorbiaceae. The size of the longs indicated that the trees attained gigantic proportions. The rate of growth seems to be fast as seen from the annual rings. The absence of branch "wood" and smaller "roots" in the site probably indicates that the remains have been shifted from the place of its origin and brought to surface, again by another geological upheaval.

The approach to this village is as follows: At 84/2 mile stone on Madras Trichy trunk road Mailam — Pondicherry road branches off to the East. On this road at 88/3 M. S. a road branches off to the South to Tiruvakkarai village which is about 4 miles from that junction. The road is motorable upto the village. Watchman of the Geological Survey of India is residing in this village. He appears to be happy to lead an occasional party to the site with his bunch of keys, in this remote village.

A chip of the specimen collected from the site is now kept in Gass Forest Museum for the benefit of the interested.

Elephant Capturing

Dr. S. GOPALAN, G. M. V. C.,
Forest Veterinary Officer, Coimbatore

Nowadays, in India, elephants are mostly employed in forest areas for timber-dragging and for baggage purposes. Some are maintained in temples and some are maintained by rich persons for ceremonial processions and timber-dragging. In Burma, prior to last war, the Bombay-Burma Trading Co., was said to have been in possession of about 2000 elephants and they were engaged essentially for timber-dragging purposes. In Burma, elephants appear to have been captured either by kheddah method or by mela-shikar method.

A. KHEDDAH METHOD:

1. The first requirement is an area with plenty of fodder.

2. The site is usually a low ridge along which there is a much frequented game track.

3. On this track, a long narrow stockade is built up with posts 8 to 10 inches in diameter, every two feet the posts are driven three feet into the ground and are strongly supported by struts and convenient trees.

4. The stockade is about six feet wide, for purpose of admitting elephants to enter in single file, it is about 100 feet long and this is sufficient to hold 10 to 12 elephants herded together trunk to tail.

5. The far-end of the stockade has to be built against a large tree and above the entrance an exceedingly strong and heavy drop-gate will have to bo built.

6. Entering the stockade is a large funnel built only slightly less strongly constructed than the stockade itself, the angle between the arms of the funnel being about 60° and each arm being about 400 to 600 yards in length.

7. On completing the stockade or funnel, it has to be camouflaged, and the herd of elephants must be "induced" to move into the area about two miles in front of the funnel. The "inducing" may take some days, i. e., a week or a

fortnight ond this is done slowly and steadily by men just making their presence known to the elephants in such a way that they move in the desired direction without being frightened,

8. On manoeuvring the herd into the right place, will the drive begin. It is always carried out at night with much firing of guns and crackers, with beating of gongs and shouting, the elephants are driven into the funnel and as soon as the stockade is full, the person in charge of the drop-gate cuts the ropes and seals the fate of animals which have entered.

9. The captives in the stockade are to be roped as quickly as possible, sometimes it may be necessary to shoot a large tusker which has entered there, in order to prevent it killing other animals in its frenzied efforts to escape.

10. After securing all the elephants, they are to be taken out of the stockade one by one, ahd put into separate crushes in order to impart individual attention and training.

B. MELA-SHIKAR METHOD :

This requires very steady, strong and well-trained elephants. Ranging two trained elephants each wearing a harness of rope, on either side of the wild elephant to be captured, and, keeping under cover of those trained elephants, the operators fasten the wild elephant to the rope-harness, and only at a late hour will the wild elephant realise itself being tied up. With the help of the trained elephants, it will be marched and put in a crush or the training-house, all along the way, during the march to the crush, the new-capture will be struggling and pulling this side and that in the attempt to escape and it be an impossibility on account of the physical strength and ability of the two Kumkies or trained elephants. Youngsters about 8 to 10 years of age are usually marked and caught by the operators and elephants over 20 to 22 years are invariably released. The kumkies will generally be over 25 to 35 years or more in age and will invariably be strong and sturdy.

In Assam and Orissa and in many places, the Kheddah system is generally adopted ; the mela- shikar method is indeed a diffcult art, and it is said to be gaining more and more popularity.

In Mysore Forest Department, periodically wild elephants were being caught by Keddah system on a large scale. The word "Keddah" meant 'trench'. This involved elaborate preparations, much labour and expenditure. A large herd of

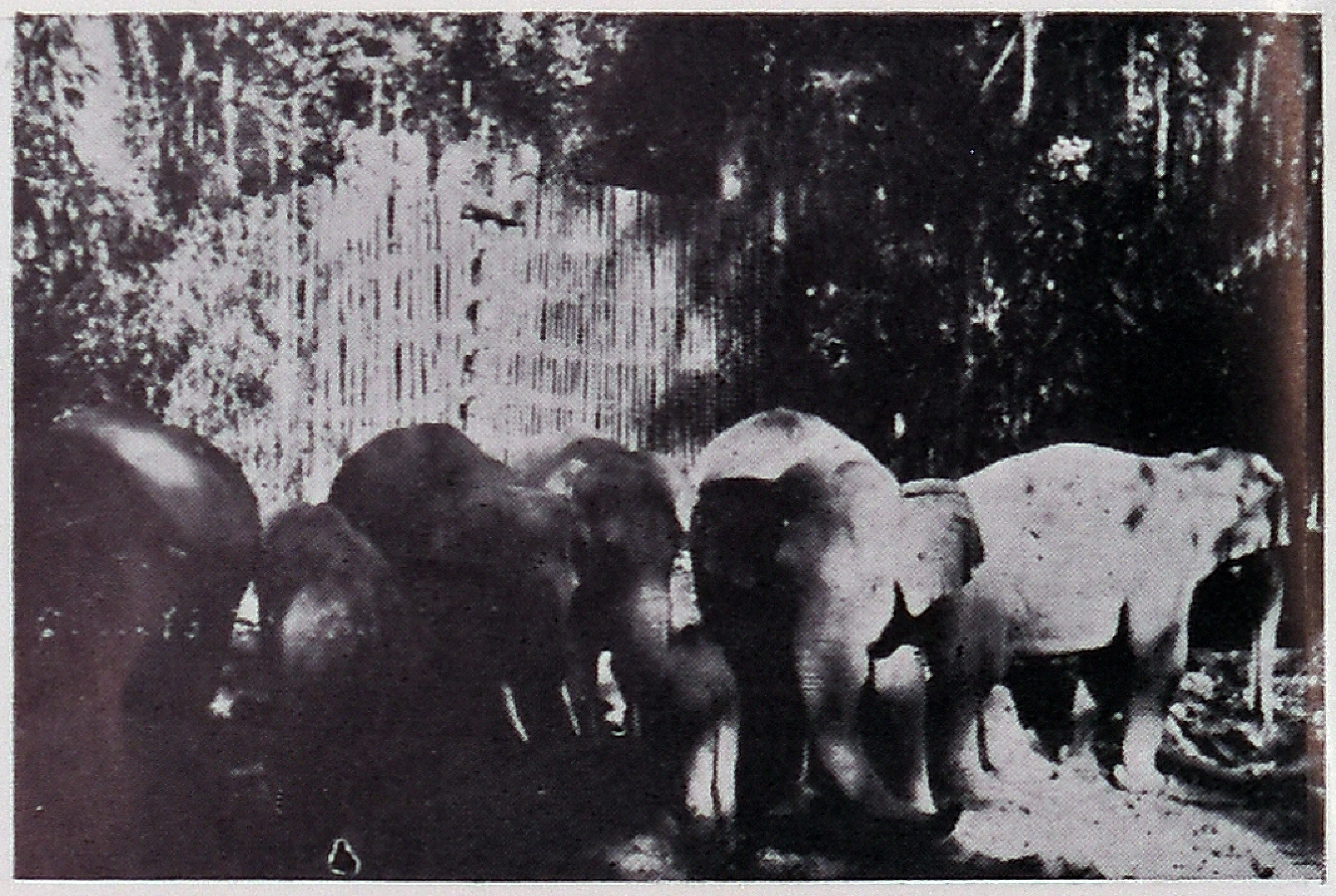
elephants about sixty to a hundred in number had to be located by watchers and then a large party of men had to entrench behind the herd and drive them for days together towards the direction of a strong enclosure built with strong teak logs and kept ready for elephant catching operation. A 'V' shaped trench, 10 feet wide and seven feet deep had to be dug around this area at vantage points, huge drop-gates cleverly camouflaged were erected. On arrival of the herd into the enclosure, the drop-gates were closed. Adjoining the enclosure a smaller enclosure about forty feet in diameter had to be erected, as the roping stockade, through special gates, a few elephants of the herd, were at a time, let in or driven into the roping stockade with the help of a few daring and intelligent mahouts and three or four trained elephants, known as kumkis. Then the three or four kumkis would arrange themselves round a single wild elephant in such a way that the latter would not be able to move about, and the mahouts would cleverly slip a rope round the neck and noose it carefully. The other end of the rope would be tied firmly to a strong stanchion. Then the legs of the wild elephant would be roped. The latter would struggle for some time and become tired. The ropes would then be tied to kumkies and the animal taken out to the river and after watering would be tied to trees for a few days more to break its spirit, before being taken to the training camp. After completion the operation of roping and securing all the elephants which were inside the roping stockade another batch of elephants would be driven into the roping stockade and the roping operations repeated with the help of mahouts and kumkis. The large stockade would be provided with sufficient fodder and water and a large number of rice packets also were being thrown inside daily for wild elephants to pick and eat. The capturing-ropes were made of hemp fibre, they were thick and strong. Indeed these operations were very thrilling. But the cost was prohibitive. (Kakkankote was the place where elephants capturing operations were formerly done in Mysore State). It was adjacent to Wynaad Taluk of Kerala State.

In Kerala and Madras Forest Departments the elephants were being caught by the pit method. For this purpose, the frequent movements of elephants in South Coimbatore and Nilgiris divisions of Madras State, and in Wynaad and Nilambur divisions of Kerala State had been taken advantage of by them.

The chief centres where the capturing operation by the pit system was formerly done, had been Tunacadavu Range of South Coimbatore Division, Mudumalai Range in Nilgiris Division, Begur Range, Chedleth Range and Sultan's Battery Range of Wynaad division, each of those ranges had about 30 or 40 pits

KEDDHA OPERATIONS

KEDDHA OPERATIONS



covered in selected localities. Most of them were old ones, in place of useless and condemned ones, every year, a few pits, say about half a dozen to a dozen pits were dug newly in each range. After separation of Malabar in 1956, elephant catching operations are being carried out in Madras Forest Department only in Tunacadavu Range. The dimensions of the pits are now as follows:—

The top layer is a square on a ba-e of 12 feet the bottom is a square on a base of 9 feet, the depth of the pit is 12 feet, each of the four walls forms a smooth inclined plane, intended to break the fall; in addition, a bedding with brushwood for a depth of four feet and over that a layer of grass to a height of 2 feet is provided for purpose of lessening the shock and reducing injuries. Digging of new pits, repairs to old pits and covering them will have to be done sufficiently in advance, say, a month prior to the expected migration of herds of elephants. It is best that pits are arranged in groups of three, their centres forming an equilateral triangle on a base of about 20 yards. Of three pits, two may be on either side of the track, and the third on the farther end of the path. By this arrangement, if the animal moving in advance falls in the farthest pit, the others following it may move to the sides and there is the possibility that one falls in each of the two pits adjacent to the track. It is important that pits should be located on a plain area and not on hill slopes. Again new earth dug out has to be taken over a distance of about 75 to 100 yards or to stream-bed or to old and abandoned pits and left covered well with dry leaves, etc., so that there will be no room for suspicion for elephants. Then special care is taken to place two dried bamboos as cross bars over the pit. Over these, split-bamboos are spread from one side to the other in level with the ground. Then broad leaves and dried grass are spread over the entire pit surface and a thin layer of earth similar to the surrounding locality is strewn over the leaves or grass. Creepers, bamboo growths, lantana growths, grass, etc., growing high by the sides are bent over the pit. In short the camouflaged surface of the pit is made to appear as natural as the surrounding area. While digging pits and removing the dug-earth, it is important that the adjacent places are not disturbed at all. Also, before covering the pits, necessary repairs to the Kraals are to be carried out and sufficient kumkis, say about four or six elephants and four capturing ropes are to be kept ready at a convenient centre. Each rope may be about 25 to 30 yards long. At one end there should be a loop about 4 to 5″ in diameter. The thickness at the loop-end may be 2 to 3″ if it be manilla rope, If it be made of *St erculia villosa* fibre, it may be about 3 to 4″. The other free end may be gradually tapering.

On receipt of information from pit-watchers about pit-falls, the staff with the kumkis, their attendants, the noosing ropes, and the mazdoors move on immediately to the pit area. As far as possible, all attempts are to be made to rope the animal on the neck and legs of the animal. The axemen will have to be engaged in cutting billets and twigs' some mazdoors will be required to hold the the free end of the capturing rope and relax or pull it as per directions from the chief of the capturing operation during the process. Some mazdoors will be required to bring water in bamboo-tubes and pour it on the head and body of the pit-fall, if it appears tired and exhausted. (Bamboo-tubes are suggested because they are handy and may be easily available in the locality in no time, and even if the elephant catches it sometimes while pouring water and breaks it, it will not matter much.

First the approximate height of the pit-fall is to be gauged. About 3/4 to 7/8 the height is taken as the girth of its neck. From the loopend along the rope the calculated girth measurement of the neck of the pit-fall is measured and at this point between the strands of the rope, a spindle-shaped wedge is passed and tied firmly. The tail-end of the rope is now passed through the loop and after winding once or twice round the trunk of a tree near the pit, it is handed over to the mazdoors posted to hold it. The next requirements are five or six poles each measuring about 12 to 15 feet in length with a hook-like arrangement at one end. These are usually got ready by cutting about 5 or 6 bamboo-poles of the acquired length and removing all the twig-like branches from the various nodes of each of those poles except the one at the last node of their stouter ends. In this branch, a length of about 4 or 6 inches is left intact with the node at the stouter end of the pole forming a simple hook-like arrangement. In addition, a pole free from any such hook-like arrangement measuring about 15 to 18 feet is required; to one end of this pole, a white cloth is to be tied and kept ready by one of the important persons. Then five or six persons are selected and each of them is given one of the poles with a hook-like arrangement and instructed to hold the thin end by the hands and the widened noose of the rope by the hook-end and stand forming a ring round the pit. Then they have to move carefully round the pit in such a way that the noosing rope is held straight over the head of the pit-fall about four or five feet above the surface level of the pit. When this is kept ready, the person holding the pole with a white cloth at one end, stretches the pole and brings the white cloth at the centre of the noosing rope and waves it in order to attract the attention of the elephant and tempt it to raise the head and trunk to

catch it, at the opportune moment, caution is given to the five or six persons. holding the noozing rope to release it from the hooks, then it falls round the neck of the pit fall. At once the mazdoors who hold the free end of the rope pull it tight so that the noose round the neck reduces the length upto the wedge on the rope. (Sometimes, during this part of operation, the noose may escape falling round the neck and the elephant may catch it by the trunk, kick and bite it. Then it becomes necessary for the mazdoors who hold the free end of the rope to pull it with all their force and weight, and those standing round the pit may have to stand at a safe distance, scare and force the elephant to release the rope, and for this purpose, the men may have to deal a few blows on the animal's body. It will be best that five or six persons posted to hold the noosing rope act simultaneously and intelligently in releasing it at the opportune moment, so that in the first attempt alone, the noose falls well round the neck and further attempts, force and violence against the pit-fall are avoided as far as possible.

After succeeding in putting the noosing-rope round the neck of the elephant, the next task is to see that the rope is not too loose, lest when the animal struggles to escape during the march to the Kraal, the rope may not come off the neck. It is all the more important to note that the noose should not be too tight lest the animal will be strangled and death will be the result. In case it is found to be tight, it should be removed at once and the wedge re-adjusted to the required length. For purpose of tightening the noosing rope to the proper length round the neck of the new capture, the experienced and chief noosing-expert among the attendants seizes the opportune moment when the elephant stands quiet after struggling for some time after putting the noosing rope, lies flat on the edge of the pit and without the knowledge of the pit-fall silently, carefully and breathlessly adjusts the neck and rope by passing beneath the wedge and loop a thin cord, one end of which had been already attached to the loop in shape of 8, as many times as necessary and fixes it well so that the rope fits in with the neck without strangling it and without slipping from it however much the animal struggles and attempts to extricate it. During this part of operation four skilful and able attendants hold the noosing-expert one on each leg and two by a good cloth passed round his waist, and simultaneously watch the pit-fall so that it may not catch the noosing-expert by the trunk.

Then one of the hind legs of the elephant has to be noosed above the hock. For this purpose, the free end of a rope is passed through the loop and after winding round the trunk of another tree nearby once or twice, it is handed over to

some mazdoors. The thicker end with the loop and widened noose of about 3 or 4 feet in diameter is slowly let down the wall of the pit to the bottom behind the hind legs without the knowledge of the elephant. Seizing the opportunity when the animal places one of the hind legs inside the noose, caution is given and it is pulled tight by the mazdoors. Then by means of thin cord or rope it is tightened by several twists round the leg-rope immediately beneath the loop. (If need be this may be secured well, after the animal comes out of the pit).

If the pit-fall be a small elephant, say 7′0″ or below in height at shoulder-level, then these two ropes will do ; but if it be 7′6″ or more it may be necessary to rope the other hind-leg and put a chain or one more rope round the neck of the pit-fall; after securing the new capture with necessary ropes and chains, the end of each rope or chain is tied to one decoy elephant. It is necessary that the four kumkis to which the ropes are tied should have their baggage harness, viz., Ghadi and numdah fitted on their back and then only the free end of the ropes, etc. from the new-capture's neck or legs are passed round their chest and tied. Also care is taken that while tying the ropes, etc, to the kumkis, sufficient length of rope and chain (say about 7 to 10 yards), should be left loose and free in order to ensure that a safe distance in front and the rear between the capture and the kumkis while marching to the Kraal.

Now sufficient quanities of billets and twigs are put in the pit carefully without injuring the pit-fall; it slowly rises up the pit and as soon as it comes out of it, it may struggle and try to escape. But it becomes an impossibility, having been tied to powerfull kumkis. Now if any of the leg-ropes is loose, it is cautiously tightened so that it may not fall off during the march.

Then the kumkis holding the neck ropes have to lead in front and those holding the leg ropes will be following in the rear. If need be, two more kumkis may be ordered to come by either side of the captive. After struggling and moving a short distance, the new capture may easily follow the forward decoys.

Some mazdoors have to carry water in bamboos-tubes and in case the captive appears tired and exhausted, water may be poured on his head and body.

The pitfall and the Kumki Elephant behind.

The 'Captive' with the noose around its neck is helped out of the pit.

evening. After some days, when the animal settles well inside the Kraal, the screen, etc., may be removed and facilities for seeing men, traffic, etc., may be given as much as possible. The wounds of the new-captures are to be dressed regularly in accordance with instruction of the Veterinary staff. Daily about 4 ounces of common salt may be added to each trough of drinking-water, twice. The words of command by the attendants to elephants are in Hindustani, about 40 or more. It is not advisable to capture elephants which are old, say about 50 or more and very big in size, say about 9′ and above in height, it is better to release them, for if they are captured, they invariably pine and die.

Convocation of The Southern Forest Rangers College, Coimbatore

The annual Convocation for the batch of 1962—,64 batch of the Southern Forest Rangers College, Coimbatore were held on 31st October 1964 in the Assembly Hall of the Southern Forest Rangers College when Shri M. Bhaktavatsalam, Chief Minister, Government of Madras delivered the Convocation Address. Shri **R. C. Kaushik**, Director of Forest Education, Forest Research Institute and Colleges, Dehra Dun welcomed the Chief Guest in the Following words :—

Respected Chief Guest, Ladies and Gentlemen,

On behalf of the President, Forest Research Institute ond Colleges, under whose over-all control the Southern Forest Rangers College and Forest Research Centre, Coimbatore, function and all other concerned authorities, I have the proud privilege to extend to you all a most cordial welcome to the Annual Convocation of this College. We are grateful to you for the trouble you have taken to spare your valuable time to encourage us by adding dignity to this function.

To you Sir, we are particularly greateful for having accepted our invitation to preside over this Convocation of the College and deliver the Address in the midst of numerous important engagements and pressing problems. Due to reasons beyond our control, we could not help approaching you rather late with the request to grace this occassion to-day. Knowing your very long association with Forests and Forest Services as the Minister for Forest Department in the State of Madras, your continued keen interest as Chief Minister in the development of Forest Resources and profound affection for the Forest Services, we felt sure Sir, that you would not disappoint us. We are, therefore, specially indebted to you Sir, for the encouragement to us, the Foresters, in consenting to our request.

Your valuable contribution in various meetings of the Central Board of Forestry after the initiation of the National Forest Policy in 1952 and in the Wild Life Board of India are well known to all of us who have been in touch with these

deliberations. Your understanding approach in matter of Forest policy and administration has oriented and guided the thinking of Foresters not only in Madras State but also elsewhere in the country. The Madras Forest Department is particularly fortunate in having you as the Chief Minister of the State. An association with a person like you who has an intimate knowledge of the useful service redered by the Foresters in the country and who has a keen interest in men and matter of Forestry is a source of great inspiration and encouragement to us.

The students who after successful completion of their 2 years' training in this College are passing out to day to take up responsibilities in the Forest Deaprtments of various state are singularly fortunate to receive your blessings and valuable advice and so are we, in charge of the training.

With your blessings, Sir and goodwill of all the ladies and gentlemen who are amidst us today, we commence our proceedings.

Then he presented his report on the working of Southern Forest Rangers College as follows:

The commencement of training of Forest Rangers to man the expanding cadre of Forest Service in India dates back to 1879. Central Forest School at Dehra Dun was the first institution of this kind in the then British Empire It catered to the needs of Madras Presidencey also which comprised of the present states of Madras and Andhra and parts of Orissa, Mysore and Kerala. In 1907, it was felt that Dehra Dun School could not train enough men to meet the needs of the whole country. The necessity of opening a separate college to train forest rangers from South India was considered advisable. In 1912, Madras Forest College was founded to meet the training requirements of Madras Presidency and adjacent areas. It was taken over by the Government of India in 1948 and named as Southern Forest Rangers College. Ever since, with the exception of a short gap from 1939 — 1945 this College has continued to train Forest Rangers drawn from Madhya Pradesh and all the States located southwards of it.

During the year under report there were 215 students in the College, lll being in 1962—'64 Course and 104 in 1963—'65 Course. Nearly 85% of the trainees are from Madhya Pradesh, Maharashtra. Mysore and Gujarat. The remaining are from Andhra Pradesh, Madras, Orissa, Goa and Andamans apart from five

students from Ceylon, Thailand and Malayasia, Todate, including the 110 students passing out today 1691 Forest Rangers have passed out from the portals of this historical college.

As a part of the Forest Research Institute and Colleges, in 1952, this college came to be recognised by the Food and Agricultural Organisation of the United Nations as training centre for South-East Asia and the Pacific Region. Prior to this also some Forest Rangers from Ceylon used to be trained here but thereafter students have been regularly coming from Thailand, Sarawak, Ghaa, Uganda British guiana etc , apart from Ceylon. Amongst those who are passing out from this College today. there are two students from Ceylon.

A pofessional education in a broad based technology like Forestry cannot be considered efficient without a close touch with research workers and research in the related fields. Originally the location of the College was determined by the presence of the Agriculture College next door, which undoubtedly proved very useful. But with specialisation in the corresponding fields as applied to forestry, unlike the Northern Forest Rangers College, which is located in the Forest Research Institute at Dehra Dun, this college had considerable disadvantage. This handicap has now been removed. Since 1959 a Regional Research Centre comprising of various biological fields has been opened here under the charge of the Principal. It is proving very helpful in improving the training standard.

Course of Studies:

The training course which lasts for two years is meant to train professional foresters after Pre-University or Intermediate education in a recognized university and also prepare them physically and mentally to successfully discharge the duties of Forest Rangers, in the Forest Service Cadres.

The syllabus covered during the course is uniform for the Northern and the Southern Forest Rangers Colleges. with a slight modification to meet the specific requirements of the forests of southern region. The syllabus now in force was recently revised to incorporate the current trends in forestry in the country to meet the present day needs.

A comprehensive and balanced professional education is imparted covering Silviculture, Forest Mensuration. Elementary Forest Management, Forest Utilization, Forest Protection, Forest Botany, Survey and Drawing, Forest Engineering, Forest Law and Forest Accounts and Procedure, apart from allied subject of Soie Science, Elementary Physiography and Geology.

Execution of various operations large and small in the management of Forest resources in the country is an essential function of the Forest Rangers. The successful execution of extensive and multifarious Five Year Plan Programmes is therefore depended on the performance of the Forest Rangers. An emphasis on practical work during the course of training is therefore ensured.

Apart from field exercises on the weekends and other practical works during the week at head-quarters, the students including those who are passing to-day, were taken out on study tours for practical work in the forests located in the majority of states from which the trainees are drawn, in addition to Uttar Pradesh and the Forest Research Institute at Dehra Dun. During these tours which lasted 33 weeks during the cours they studied various types of forests, management methods adopted under different condiions and the actual activities in forestry in all aspects. A considerable time was also devoted to practical work during these tours.

The students, who are passing out to-day, also underwent a short course in Field Engineering and Weapon training with the Crops of Engineers at Bangalore in ,July, 1964. This training is invaluable as a practical exercise in construction of bridges, derrick and other engineering structures.

To enable confidence in handling emergent situation, training in First Aid was imparted during the year to 1962—'64 Batch, leading to the award of certificates of St. John Ambulance Associaton. Out of the total strength of 11I, ninety six qualified and twelve failed. One trainee could not undergo the course due to illness and two of them already had earned the certificate previously.

Physical Training and Sports:

To build up physique, stamina and endurance to withstand rough life in the forests, streneous physical training in the mornings and outdoor games and atheletics in the evenings continued to be a compulsory part of the programme of training.

The attainment in physical standard is judged by the performance during the tours and by the results of the Marathon race extending over seven miles which every trainee is required to complete within eighty minutes. The race was run on 23rd January, 1964 and the cup for leading in the race was won by Sambasivam from Madras State belonging to 1963—'65 course.

The Annual Atheletics organised by the students were held on 11th January, 1964. Wing Commander J. W. Fenn, Station Commandant, Air Force Station, Sulur, Coimbatore, presided and Shrimati Fenn distributed the prizes to the winners. Championship cup was annexed by R. K. Ghana of Orissa Timber Corporation, a student of 1963—'65 course.

Each of the two courses is divided into three divisions or clacses for educational purposes and other activities. Inter division tournaments in various games were held which were keenly contested.

There are only four play grounds for foot-ball and hockey. As a result majority of students have to be kept busy in less strenuous games like volley-ball, and badminton. Space is available in the campus. Immediate development of adequate number of play fields for strenuous games is absolutely unavoidable. This deficiency, it is hoped, will be made good shortly.

Extra Curricular Activities:

The duties of a forester require a good power of speech, capacity to mix with people and interest in wild life. He has also to acquire hobbies to find relaxation in remote places where he is mostly req uired to serve. The extra curricular activities in the College aimed at inculcating the aforementioned qualities amongst the trainees continued to be an important feature of the training.

The students are organised in an Association comprising of six sections dealing with literary and scientific activities, sports, indoor games, wild life preservation, camera club for amateur photography and the College magazine.

The Literary and Science Section undertook screening of films on a wide range of subjects with the help of outside agencies, maintained a library of general and scientific books and magazines and provided facilities for reading of papers on various subjects by the students. Seminars and debates were also arranged.

As part of activities of the Wild Life Section of the Association, the students visted wild life sanctuaries in Madras, Mysore and Kerala to study their management. A brief training in capture of elephants was organised in the field. An insight into the training and management of elephants was also giveu.

The functioning of thc Camera Club had to be restricted for economic reasons as prices of films and photographic materials have gone beyond the means of the Rangers students.

Facilities for lndoor games were regularly maintained and tournments held.

Publication of the College magazine is in arrears, primarily due to the difficulties of printing. It is expected that shortly the arrears will be cleared.

Library:

There is a good library in the College but for the much increased number of trainees provision of larger number of copies of publication has become unavoidable. It is being looked into as a part of the expansion of facilities at this College.

Even otherwise, with the opening of the Regional Research Centre, the library needs building up to meet tne new requirements in various biological fields.

Museums and other Audio-Visual Teaching Aids:

Over a dozen exhibits were added to the Gass Forest Museum during the year. Models, charts photographs and such other audio-visual aids were maintained and supplemented where necessary. A stock of slides ond film strips need to be built up. This is receiving attention.

Medical Facilities and Health of Students:

At present the medical facilities are available in Lawley Road Dispensary and the local district hospital. With the large number of students and staff the necessity of a regular dispensary on the estate is keenly felt. It is proposed to provide for this in thc 4th Five Year Plan. Generally all steps to ensure good health amongst the trainees were taken with success.

College Estate and Accommodation :

The College estate comprises of 174 acres. Demonstration plots for practical work like nursery planting, tending and other operations are located in the estate. With the expansion of the training capacity and starting of a Forest Research Centre more area is needed. The Government of Madras and Kerala have very kindly agreed to lease 25 acres in Sadivayal and 200 acres in Walayar. There is no scope of expansion locally.

The main college building was constructed to provide class rooms, laboratories, hall, common room and library, etc. barely for 60 students. As already stated there were 215 students in the College during 1963—'64 and in subsequent years the number is expected to rise, still more. There are only two lecture rooms with a capacity for not more than 80 students at the most. The students of the 1962—'64 course, numbering 111, had to be accommodated in an extremely congested condition. Any bigger classes cannot possibly be held in these lecture rooms. The position of the laboratories and other supplementary accommodation is the same. If the strength of the trainees has to be maintained as proposed, immediate construction of adequate college accommodation is unavoidable to secure proper standard of education. This is receiving attention.

Regarding hostel and mess facilities for the students, the accommodation as available at present, will not be adequate with the increased number of students, who are expected to join on 1st November, 1964. Steps are being taken to provide the extra accommodation to the required extent, without which the proper atmosphere for the students to acquire knowledge cannot be created.

It is a matter which needs urgent attention and solution to be found without delay.

A common mess arranged and controlled by the trainees themselves under the supervision and guidance of the Principal, continued to be maintained. Common room and lounge accommodation which is essential with a mess is meagre. With the increased number of students, even this will have to be converted into dining accommodation. Actually the present mess is housed in one of the temporary buildings constructed during the last war. It is hoped that regular and adequate mess building will be constructed soon to enable proper training of the increased number.

Due to the increase in the Instructional as well as other staff the residential accommodation is also very inadequate. It has been agreed in principle that accommodation for the Instructional staff should be constructed in the estate. The pattern of training imparted is such that the residence of staff is the Estate is unavoidable. The construction of accommodation is expected to be given a concrete shape soon.

The Public Works Department continued to look after the building. During the year repairs were not undertaken due to Emergency. The buildings being old and many of them of temporary construction, urgent attention of the C. P. W. D., is needed. It is hoped that something will be done expeditiously.

Staff :

The strength of the instructional staff of the College consists of the Principal, 4 Instructors, 6 Assistant Instructors and 1 Assistant Lecturer in Engineering and Surveying. Assistant Lecturer in Engineering and Surveying is on long leave and is on medical treatment. The Curator is in charge of the Museum. The Curator Shri T. R. Somasundaram, on his promotion as Research Officer, Dehra Dun, has been relieved on 4—7—1964 and arrangements are being made to post a substitute. The post of the Principal has been re-designated as Principal and Head of Biological Research, Southern Forest Rangers College and Research Centre, from 9—7—1963.

The following changes took place among the Instructional staff :-

1. Shri K. M. Guruswamy Gounder, reverted back to Madras State on 1—4—1964.

2. Shri V. K. Karunakaran Nair, proceeded on leave from 1—5—1964 and on expiry of leave reverted back to Madras State.

3. Shri T. Rajamannar, of Andhra Pradesh, joined the College as Assistant Instructor on 12—6—1964.

Shri J. P. Thomas, Assistant Lecturer in Engineering and Surveying, is on long leave on medical grounds from 23—11—1962.

Arrangements to secures the services of two Instructors and two Assistant Instructors per class for the increased number of trainees who are joining on 1st November have to be made, urgently. This is receiving attention of the Government of India.

Examinations :

Apart from the periodical examination, first year and the final year examinations were conducted with the help of numerous forest officers in the States and the Officers of the Forest Research Institute and Colleges. The Professors from neighbouring Agricultural College and Sugarcane Breeding Centre acted as Examiners, in Botany, Entomology and Mycology.

The final order of merit is based on the examination results, practicals, viva-voce, performance on tours and extra curricular activities. Prizes for best performance in nine subjects are awarded. The results and the names of the prize winners will be announced by the Principal, after this report.

Acknowledgement :

We are grateful to the Commandant, Corps of Engineers, Bangalore, Chief Conservators of Forests and other Officers of the States in which the Classes toured; and particularly to the Chief Conservator of Forests, and Officers of the Madras State, District Medical Officer, the Medical Officer-in-Charge of Lawley Road Hospital and the Railway authorities for all the co-operation and help which we got in imparting the training.

We will be failing in our duty in not to thank all the Officers from the States, from Forest Research Institute and Colleges, Dehra Dun and other departments for acting as Examiners. We are grateful to them for helping us in assessing the suitability of the students for the award of Certificates.

Message to the out-going Students :

As Director of Forest Education it is my duty to say a few words of advice to the out-going students.

My dear students, I heartily congratulate you on your success and particularly those who have won different prizes.

To you Jaymanne and Basnayake from Ceylon, I would like to convey that we are very happy on your success. We were indeed glad to have you in our College. I am told you felt absoutely at home, amongst your colleagues. We

are sure you are going from here with a feeling of spending two happy years very usefully with us not only from the point of view of acquiring professional knowledge in forestry but also for having developed close ties of friendship with a large number of your counterparts in your neighbouring country. Please convey our compliments to your Seniors in the Forest service. I wish you God Speed. Don't forget to keep up contacts.

To the rest of you I would only say that within a few days you are joining the ranks of the Forest Departments having over a century old high traditions in the country. The traditions of your Alma Mater are also based on these. Professional integrity, and devotion to duty are our watch-words; do not forget them. Here, only a foundation has been laid. You have to build up knowledge through the process of self learning during the service. What you will be rests on you entirely. Keep your eyes open and maintain sensitivity to your surroundings. Watch for variations and exceptions for therein lies the seed of progress. Be perfectionist by habit and persistently drive for better and still better results. Learn to find satisfaction in your work. A rigid self discipline which has been inculcated in you here will stand you in good stead since appreciation of duty and its fulfilment is merely an out come of self-discipline. Heavy responsibility and bright future, which you have to make and not to wait for it awaits you in your career, in the department. I am sure, you will forge ahead and succeed in achieving the goal, both for the nation and yourself.

I wish you best of luck.

Then Shri M. B. PETER, Principal, Southern Forest Rangers College read out the results.

Respected Sir, Ladies and Gentlemen,

I am glad to announce that 100 students out of the 111 students who constituted the 1962—'64 Rangers Course, have been adjudged to have qualified for the certificates — one student could not attend the College for over eight months due to health reasons and he has to undertake the 2nd year course again when he is fit. This year there are no students who have qualified for the Honours Certificate and the rest only Lower Standard Certificate.

I shall now call out the names of students in their order of merit when they will please come forward to receive the certificates from the Honourable Chief Minister. I now request you, Sir. to kindly award the certificates and prizes.

Sl. No. in order of merit	Name of student	State	Sl. No. in order of merit	Name of student	State
	HONOURS — Nil.		23.	R. S. Dubey	Madhya Pradesh
	HIGHER STANDARD:		24.	B. L. K. Gota	Gujarath
1.	V. N. Mishra	Madhya Pradesh	25.	K. M. Raval	Gujarath
2.	P. C. Verma	Madhya Pradesh	26	C. P. Raje	Maharashtra
3.	P. V. Santharam	Madras		S. B. Shetty	Gujarath
4.	Edwin Jeyaraj	Madras	28.	S. C. Verma	Madhya Pradesh
5.	L. Basnayake	Ceylon	29.	G. M. Raut	Maharashtra
6.	E. D. W. Jayamanne	Ceylon	30.	Mohd. Naseeruddin	Andhra Pradesh
7.	V. S. Deshpande	Maharashtra	31.	K. K. Kuruvilla	Gujarath
8.	S. K. Tembe	Gujarath	32.	A. D. Uppal	Maharashtra
9.	B. S. Sharma	Madhya Pradesh	33.	R. R. Yadav	Madhya Pradesh
10.	L. Kameswara Rao	Andhra Pradesh	34.	S. R. Bukkawar	Maharashtra
11.	R. Sreeramulu	Andhra Pradesh	35.	S. K. Bhand	Madhya Pradesh
12.	A. B. Washikar	Maharashtra	36.	Y. R. Ladwa	Gujarath
13.	S. K. Shrivastava	Madhya Pradesh	37	K.A.R.Subramaniam	Gujarath
14.	V. Vijayaraju	Andhra Pradesh		Gulam Moinuddin	Madhya Pradesh
15.	U. S. Sharma	Madhya Pradesh	39.	T. K. Kushalappa	Mysore
16.	M. P. Gulhane	Maharashtra	40.	D. D. Nanaware	Maharashtra
17.	A. B. Appanna	Mysore	41.	S. N. Rajagopal	Mysore
18.	R. K. Tiwari	Madhya Pradesh	42.	H. Govinda Rao	Andhra Pradesh
19.	S. B. Hombal	Mysore	43.	S. K. Dwivedi	Gujarath
20.	S. L. Arora	Maharashtra	44.	M. P. Somanna	Mysore
21.	Syed Inayathulla	Mysore	45.	S. A. Patil	Maharashtra
22.	K. Kamal Pash	Madras	46.	D. Singh	Madhya Pradesh
			47.	S. K. Dixit	Madhya Pradesh
			48.	J. D. Gwawlanshi	Maharashtra
			49.	G. A. Deoray	Gujarath

Sl. No. in order of merit	Name of student	State
50.	Syed Naimuddin	Mysore
51.	M. K. Raykar	Mysore
	S. A. Vaidya	Maharashtra
	N. I. Yenagi	Mysore
54.	B S. Jain	Madhya Pradesh
55.	M. C. Shukla	Madhya Pradesh
56.	C. P. Mahto	Madhya Pradesh
57.	D. E. Naik	Mysore
58.	K. George	Andamans
59.	S. R. Rohi	Gujarath
60.	K. Mohanswamy	Andhra Pradesh
61.	K. Ram Mohan	Andhra Pradesh
62.	S. N. Khotele	Madhya Pradesh
63.	S. R. Tiwari	Madhya Pradesh
64.	S. A. Qureshi	Madhya Pradesh
65.	B. S. Sankeshwar	Gujarath
66.	B. S. Rajput	Madhya Pradesh
67.	Mir Masood Alikhan	Andhra Pradesh
68.	R. S. Sisodia	Madhya Pradesh
69.	N. B. Kulkarni	Maharashtra
70.	Y. S. Sharma	Madhya Pradesh
	S. A. Jadhav	Gujarath
72.	V. N. Hedaoo	Maharashtra
73.	S. J. Naik	Mysore
74.	S. M. Sapre	Maharashtra
75.	S. D. Nilawar	Maharashtra
76.	V. R. Naik	Mysore
77.	P. D. Sharma	Madhya Pradesh
78.	K. Kannan	Madras
79.	G. G. Shetty	Mysore
80.	J. S. Saxena	Madhya Pradesh
81.	P. Venkataramana Bhat	Mysore
82.	L. M. Sharma	Madhya Pradesh
83.	B. C. Kalele	Madhya Pradesh
84.	S. H. Guha	Madhya Pradesh
85.	S. M. Sharma	Madhya Pradesh
86.	M. S. Hora	Madhya Pradesh
87.	S. L. Datwani	Gujarath
88.	A. R. Hublikar	Maharashtra
89.	B. Prasad	Madhya Pradesh
90.	H. S. Chondawat	Madhya Pradesh
91.	S. V. Mujumdar	Madhya Pradesh
92.	G. S. Negi	Madhya Pradesh
93.	C. S. Virkar	Madhya Pradesh

Sl. No. in order of merit	Name of student	State	Sl. No. in order of merit	Name of student	State
94.	R. D. Harikanth	Mysore		**LOWER STANDARD :**	
95.	M. Karim	Madhya Pradesh	103.	G. R. Kamath	Mysore
			104.	M. B. Hosur	Mysore
96.	V N. K. Scott	Madhya Pradesh	105.	H. A. Dani	Madhya Pradesh
97.	Chinnaswamy	Mysore	106.	S. Shantwan	Madhya Pradesh
98.	R. Ganesh Aiyer	Madhya Pradesh	107.	S. P. Dikshit	Madhya Pradesh
99.	H. T. Khobragade	Maharashtra	108.	D. P. Calappa	Mysore
100.	S. Chinnaswamy	Mysore	109.	G. S. Pardeshi	Madhya Pradesh
101.	S. S. Kankerej	Maharashtra	110.	S. K. Mishra	Madhya Pradesh
102.	S. D. Prabhune	Maharashtra			

Then Shri M. BHAKTAVATSALAM, Chief Minister,
DISTRIBUTED THE PRIZES AS FOLLOWS

Sl. No.	Name of Prize	Name of Prize Winner	State
1.	**Master's Rolling Cup** (For the Topmost Student who does not get Honours Gold Medal)	V. N. Mishra	Madhya Pradesh
2.	**The Campbell Walker Prize** (For Forestry)	V. N. Mishra	Madhya Pradesh
3.	**The Brazier Prize** (For the best outdoor Ranger)	Edwin Jeyaraj	Madras
4.	**The Lodge Prize** (For Forest Engineering)	S. C. Varma	Madhya Pradesh
5.	**College Silver Medal** (For Forest Utilization)	V. N. Mishra	Madhya Pradesh
6.	**College Silver Medal** (For Forest Botany)	V. S. Deshpande	Maharashtra
7.	**College Silver Medal** (For Range Admission)	L. Basnayake	Ceylon
8.	**Hajee Mohamad Khan's Rolling Cup** (For the Best Student from Mysore or Madras State)	P. V. Santharam	Madras
9.	**The Parvathi Kurup's Rolling Shield** (For the Healthiest student during the year)	R. S. Sisodia ***	Madhya Pradesh
10.	**The Pentland Shield** (For the best all-round sportsman in the College during the year)	R. Ganesh Aiyer	Madhya Pradesh 1962—'64 Rangers Course
11.	**The Mannarghat Moopil Nair Cup** (For Marathon Race)	V. Sambasivam (Winner)	Madras 1963–'65 Rangers Course
12.	**Amir Muhamad Khan Rolling Cup** (For the best division in Marathon race.	Senior Ranger 'A' Division (1962—'64 Rangers Course)	
13.	**The Nilgiri Wild Life Association Prize**	*Ist Prize :* Shri B. S. Sharma	Madhya Pradesh 1962—'64 Rangers Course
		IInd Prize : Shri U. P. Pandey	Madhya Pradesh 1963—'65 Rangers Course

*** Awarded to the student who has the best Attendance in P. T., Lectures and Games and who has secured the highest marks in Games and Sports, power of endurance and health on tours and in Marathon Race.

After this Shri M. BHAKTAVATASALAM, Chief Minister,
Government of Madras delivered the Convocation Address

CONVOCATION ADDRESS

By

Shri M. BHAKTAVATASALAM

Friends,

It gives me very great pleasure to be here today to associate myself with the Convocation of the Southern Forest Rangers' College and to distribute the certifcates and prizes. I do welcome this opportunity of renewing my old contacts with forestry.

This illustrious instition, which is one of the two Colleges in India, is known to me for years. For over half a century it has been imparting forestry training at the technician's level for the Southern and some Central States in Indiat The Golden Jubilee of this College, which was celebrated recently, is still quite fresh in our mind. It is gratifying to know that this College has been for such a length of time serving the needs in respect of training of Forest Rangers of not only our country but also of some neighbouring countries like Ceylon, Malaysia and Thailand.

After the abolition of the proprietory rights over private forests in many States, the forest resources of our country are now, for all intents and purposes, entirely owned and managed by the Government. Unlike the case in U. S. A. and most European countries, in our country, forestry professions at all levels are confined to public services. In our Constitution, Forestry is a State subject ; and a significant feature of the forestry training programmes in our country is that they have been a responsibility of the Government. Centralised foresty trainings, which had started in our country many decades ago, are in accordance with our national forest policy and the same have resulted in a much desired uniformity of out.look and *espirit de corps* amongst the personnel.

In the echelon of forestry organisation, Forest Rangers are classed as technicians. Indeed the post of a Forest Ranger is a key post in the forestry organisation. The cadre of Forest Rangers has been regarded as the very back-

bone of forestry organisation and for good reasons too. It is the Ranger who, acting as a technician, executes ideas and gives practical shape to them The development of forest resources is ultimately moulded by his hands. For obvious reasons, therefore, the training programme for Forest Rangers must have a greater emphasis an Practical aspects.

The forests are undoubtedly a basic and valuable national resource. It has been lightly said by some that the civilization of any country rests on 'wooden walls'. It collapses if forest resource is ignored or its importance belittled. In our country's expanding economy, our planners have fully realised this, as is evident from the successively increasing allocations under the forestry sectors in the various Five Year plans. We know that unlike what it was a couple of decades ago, the demands on the forest resource for industrial raw-materials are progressively increasing with the increase in population and standard of living. Even with the present population, great scarcity of raw-material is being felt for wood-based industries like cellulose and paper pulp. It has already been sufficiently clear that there is general scarcity of all commercial woods in our country. Various projects have, no doubt, been considered to bridge this gap. For instance, a vigorous plantation drive is in hand with the Forest Departments, which is intended to increase the productivity of our existing forests and to utilize land resources in a rational manner. There is an increasing trend to prefer fast-growing species, for industrial use, in such plantations. There is also an increasing emphasis on the use of modern logging equipment and mechanized transport in the exploitation of forests, with the object of reducing the wastage and increasing the area of exploitable forests. The proposals for the Fourth Five Year Plan which are on the anvil at present entail substantial increase in such and other activities within the forestry sector. Undoubtedly, therefore, more scientific thought in the practice of raising plantations or logging and transport is called for on the part of the Forest Rangers to be able to produce the desired results. A routine attitude in this respect may cause heavy financial loss apart from waste of time and retardation in industrial progress. I am quite sure that the officers who have undergone the training in this College are fully aware of these requirements.

There is yet another important role which the Forest Rangers as a class have to play. The Ranger is the contact man between the Forest Department and the people who are interestes in or connected with the forests. It is he who has to be in touch with them in their day-to-day life. Much of the name that the Depart-

Introducing the officers to the Chief Guest.

Shri M. Bhaktavatsalam delivering the convocation address.

will agree, calls for a disciplined mind which I hope you have developed. I have no doubt that you, who are passing out today to serve as Rangers, will live up to the good traditions set out by your predecessors in the past.

It may happen that some of you who might be very outstanding and far above the average have to be satisfied with the jobs which, though not quite equal to your intellectual level, you have to accept due to circumstances beyond your control. To such of the young friends I would like to say that they need not be unduly disheartened. The vast expansion of forestry development programmes awaiting execution before the various Forest Departments in the country in the Fourth and the Fifth Five Year Plans will certainly throw open expanded fields and new vistas to enable Governments to judge and reward good performances of the techinicians.

I would once again like to say that it has been a very happy occasion for me to be here today and rejoice with you in your success. I congratulate you on your successfully completing the Forest Rangers' Course. My special congratulations go to those who receive prizes and medals. I wish you all success in your career and pray what you may be able to prove equal to the task as trustees of our national forests.

In the end Shri HARI SINGH, Inspector General of Forests proposed vote of thanks to the Chief Guest as follows.

Honourable Chief Minister, Ladies and Gentlemen,

It is now my pleasant duty to wind up the proceedings of this Convocation with a Vote of sincere thanks to all who have assembled here.

We are indeed most indebted to you, Sir, for having found time to be with us here today to preside at this function, despite very short notice from us and your other important and urgent pre-occupations. I must confess that it was with a feeling of great diffidence that I approached you at New Delhi hardly

three days ago, when you were so busy with meetings of the National Devolopment Council, to request you to preside at this Convocation. It is a measure of your keen interest in forestry in general and in this College in particular, that you so kindly and so readily accepted our invitation. Your presence here today is undoubtedly a source of inspiration to the staff and the students of this College.

We are also grateful to you, Sir, for thought provoking address which you have just delivered. It is for-tunate that, the role of forestry in the country's develop-mental activies is being appreciated to a greater extent today than perhaps ever before. We are now engaged in drawing up proposals for the Fourth Five Year plan with a long term perspective in view, particularly with reference to the country's requirements-bot existing as well as projectednin respect of the industrial timber and fuelwood. We are planning to meet these requirements as possible through our vast plantation programmes. Techniques of raising woods of fast-growing species of special commercial importance are being perfected in many States. While we do not intend to neglect the forest conservation, our approach to forestry now tends to be more dynam'c. Attention is being paid to step up productivity of forest lands. We have schemes to rehabilitate and to improve our degraded forests, open up some of our hitherto unworkable areas and reduce wastage of wood by adapting thc use of modern logging equipment and mechanised transport. A special project for starting logging training centres in the country is being launched with the assistance from the U. N. Special Fund. Similarly with the help of the same Fund a project on Pre-investment Survey of Forest Resources in certain States is also being implemented.

It will thus be seen that the sphere of activities of a Forest Ranger in the country has of recent been considerably enlarged. In addition to the usual work as a forest officer, he has now a considerable scope in technologies connected with wood-based industries. In the sphere of extension forestry, the scope for activities of the Forest Rangers has further widened.

To the young students who are passing out today from the College I would like to say that our country today is engaged in nation building activities in a big way. Your country expects the best from each of you. After your hard toil in the College you have obtained laurels and distinctions for which I congratulate you. I would today expect you, however, to keep up the these standards. You will have to lead a hard and honest lite in service. I would exhort you to face

this arduous role with diligence, patience, self-respect, scrupulous honesty and and sincerity of purpose. I pray that God bless you with good health and strength to achieve your task cheerfully.

In the end, I will once again say how very grateful we are to you, Sir, for very kindly accepting our invitation to associate yourself with this function.

To the ladies and gentlemen, officials and non-officials who have assembled here, I would like to convey to them heartfelt thanks for having taken the trouble to come over here and grace this occasion. Their presence has certainly brightened this function and thereby made it a success.

Finally, I would like to congratulate the Principal of the Southern Forest Rangers College and his staff for making splendid arrangements for this function.

The function came to a close with the singing of the National Anthem.

The Lions of Gir Forest

P. R. DABHI, 1963 — '65 Course.

I was fortunate to have had the chance of visiting on official duty, the Gir Forests of Saurashtra, the home of the Indian lions. The lion whose figure adorns our national emblem does not require any introduction to the Indians. The lion, *Panthera leos percica*, is known as "sher" in Hindi, as "shink" in Maharashtrian, "Singam" in Tamil and as "Savaj" in rural Gujarati language.

Indian lions are of saffron-colour mostly and may sometimes be greyish-yellow. The male has saffron coloured mane which turns to black when the animal grows old; the female is devoid of mane. We find a conspicuous black tuft of hair at the end of tail of both the sexes. Maximum length of the animal including tail is about 11 feet and length of tail alone is nearly half. It is about 3½ feet at the shoulder and weights about 450 lbs. They have got five digits in each paw but thumbs in front legs are not well developed. So we find four toes in the fore- legs 5 toes in the hind legs. The pug mark of a lion is about 3½ inches across. Sense of hearing and sight is very keen, even the fall of dry leaf cannot escape their hearing. It has broad front which lends an air of majesty to its appearance especially in the case of male with the mane where as back portion is narrow and tapers towards the waist. The longevity of the lion is estimated to be about 30 years.

Lions were found all over North India in olden days but due to the operation of certain historic and biotic factors they dwindled down in number. At present they are only confined to the 600 to 700 square miles of Gir Forest of Gujarat State in India. The word 'Gir' itself means jungle in Gujarati. But the term 'Gir Forest' has come to stay and has to be accepted as such. 'Gir Forest' is of the dry deciduous type, having rainfall of 35″ to 40″. Teak occurs almost all over the area; the growth is thick in moist places such as river and stream banks and poor on slopes and ridges. The importance of this forest lies more in it being a habitat of the Indian lions rather than for its timber value which is also considerable.

Lions are inhabitants of open Savannah type of country. They prefer shade and cool places for resting. They can be found sleeping at noon time under the bushes of *Carissa carandas* on the river banks. After 5 P. M. they come out of the shade and are on the move even upto next morning. They usually avoid hot period of the day for any movement. In the rainy season they move to the outskirts of the forest because of increasing population of poisonous mosquitos in the moist places. Hence much of the damage is caused to the nearby villages during the rainy season

Another special habit is that they move in family parties and by most frequented paths and tracks. Being lordly animals they move freely and fearlessly even on the roads where there is vehicular traffic. There were instances when the lions did not make way to the truck passing on the road. How aptly it is called lord of the jungle!

As my sphere of work lay in this lion infected jungle I was the recepient of anxious enquiries from my friends and relatives, as to how I managed to live at all. I have seen lions moving freely in their natural habitat from very close quarters but I have neer seen or heard of them attacking men, some times unless when wounded or gravely provoked. You may be surprised to know that local *Maldharies* (professional graziers) fight the lions with no better weapon than a stick. Lion is liable to attack only provoked.

In the mating season lion becomes more ferocious and absent-minded follows the lioness blindly whereever she goes. Under such circumstances some times the pair simply pass through the forest village without causing any damage. Gestation period is about three and half months and litter consists of 2 to 6 cubs. Some times the young ones have spots which gradually disappear with their maturity.

Roaring of the lions which thrills the human beings is the most dignified and perhaps the strongest of animal noise. We can clearly hear the roaring for over a mile. After roaring they release breath with slight jerks and it is supposed that these jerks are indications of the age of the particular animal-more the number of jerks more the age. Reason for roaring may be to transmit some message to the other members or to strike terror in other animals. There is a belief held by the local people that they do not like to have competitors who also

roar while searching for food. It is believed that in the rainy season whenever they hear the sound of thunder they mistake it as roar of rival and rush in search of it and some of the very powerful lions are said to have died dashing their heads in this fashion. However it has not been supported by scientific study.

Though there is difference of opinion amongst experts about the relative strength of lions and tigers i. e. whether the lion is stronger or the tiger is the lion has been acknowledged as king of beasts and supposed to be the strongest amongst animals stronger, Besides it is majestic in appearance and noble in demeanour. Hence it has been given thepride of place in our national life from the dawn of our country's history to the present day. The Ashoka pillar of 3rd centuary B. C. and the national emblem of the Republic of India bore the figure of the lion.

Lions mostly feed on the other wild animals such as pig, samber, deer, blue-bull etc, but under certain circumstances they attack domesticated animals like cows, buffaloes, bullocks, horses asses etc. Horses and asses it is believed, are a delicacy to them. In 1658 when the construction of a Kamaleshwar dam was going on in the 'Gir Forests' they were using asses for the earthern work. About 50 asses were consumed by lions in very short period. Soon after they stoyped using asses. They remain concealed on either-side of the path through which animals are expected to pass and as soon as the animals come within their reach they lie low and then abruptly jumps on it. Mostly they catch the animal at neck from down below but if it is not possible they chase the animal and strike it with fore-paw. Once neck comes into its mouth, in between huge jaws and sharp teeth, then with one jerk it dashes the victim on the ground and then drags it to a suitable place to enjoy the meal. A big sized and strong buffalo can escape the attack of a lion. So usually two to four lions are found to attack a buffalo in a team. It was observed that on several occasions they severe off the tails of their victims first; perhaps because they resemble the snakes which they dread very much. They congregate at kills and start eating from the back of the kill. They consume flesh without disturbing stomach and they are clean-eaters by habit. It has been observed many a time that they come out again to the remains of kill even though they are not hungry perhaps because they do not like to leave the remains for the vultures.

There are about 50,000 cattle owned by the professional graziers who frequent the Gir Forest for grazing. It is therefore but natural for the lions to attack cattle when they are out for grazing. This creates lot of resentment in

maldharies. It is alleged that few lions were killed by maldharies by poisoning the kill. When the area was in Ex-Junagadh state, indiscriminate shooting was done by the visitors as well as by the natives of the state who were fund of shikar of lions. The habit of lions such as congregating at kill, makes them an easy target for the shikaris. Hence lions decreased in number rapidly and faced the danger of extinction. Fortunately authorities have realised the gravity of the situation and everything possible is being done to preserve these rare and magnificent animals. To find alternative home for lions, the Indian Board for Wild Life has introduced a couple in the Chandraprabha sanctuay near Banaras in U. P. Further information is not available in this regard.

As less numbers as 60 were recorded in "Gir" by Shri Jamsaheb of Navangar in 1904. According to 1955 census 290 animals, 141 male, 100 female and 49 cubs are believed to be existing. Somebody may question that how it is possible to count animals and that too such ferocious animals. For counting the lions they have considered the dimensions of their foot prints which differ from animal to animal, their movement along certain frequented paths, and their habit of drinking water at least once in 24 hours. The enumerators fix a day on which foot prints of all lions walking on all the scheduled paths and water places are measured and after compilation of this information they can estimate the number of lions. This method of census is called track method and it has suggested by Mr. Wynter Blyth. In 1962 experiment of colour spraying games was done for counting the lions but it was not successful and therefore not followed.

In 1900 shooting of lions was stopped by the Nawab of Junagadh who was having the bulk of lion territory. Thereafter to remove ill-feelings prevailing in 'maldharies' the Government of Bombay has decided to pay compensation to the owner whose cattle were killed or lifted by lions from the premises of their hutments. In return maldharies are not allowed to keep any poisoning drugs which may cause the death of animals.

Subsequently Government of Gujerat has formed a sanctuary called 'Gir Sanctuary'. Shooting of wild animals is strictly prohibited. The object was to ensure sufficient supply of food to the lions. There is also provision to keep down the population of panthers which are its only competitions for food in this area. To watch the habit and movements of lions special staff is employed. To enhance and to afford more facilities to the visitors there is a well-furnished guest house

at Sasan which commands a splendid view. Sasan is a railway station on the Western Railway between Junagadh and Veraval towns. There is an aerodrome nearby at Keshod. There are suitable good roads and vehicles to take visitors in the interior for lion-show. A prescribed amount has to be paid in advance to get a chance to see the lions in their natural habitat.

To remove the prevailing false idea and to make public aware of facts and figures a coloured cine film of "Gir Sanctuary" was prepared and screened at various places. Sri Jawaharlal Nehru, a great lover of nature has visited 'lion-show' in Gir in 1956. In 1960 Sri E. P. Gee the author of the book "Wild Life of India" has visited this sanctuary and he has described the 'lion-show' he has seen there in his book. He has also taken documentary film of this 'lion-show'. In 1962, some American travellers had visited this Sanctuary. After returning from 'lion-show' they said that "we have had great and long lasting pleasure to see the lions free in their natural habitat and we will advise the people of our country to visit this sanctuary of lions.

The Forest College and Shakespeare

S. DAS, B. SC., 1963 — '65 Course.

In the second act of his drama *As you like it* Shakespeare says

" All the world's a stage, And all the men and women merely players."

While describing the seven ages of man, he says that the whole world is a theatrical platform with men and women as the players of the drama of life, which is divided into seven acts. The first act is the infancy, when the child is under the care of a nurse. The second act begins with the school going age, when the boy creeps to the school with books much against his sweet will. The third act commences with the youth, when he heartily enjoys the charms of a lady love and so on. The seventh and the last act is the old age, which is a repetition of the childhood and hence of the first. He describes it in the second act of his drama *Hamlet* - "An old man is twice a child ".

Generally the students coming to this College fall within the age group of twenty-five and according to his classification should perform the third act of the drama of life, i. e., youth. But the part played by Forest College students does not have the qualities or characteristics, that are generally expected of a young man of twenty-five, of the present world.

Then which act of the drama of life we fitinn? - The characteristics of childhood are rather prominent in us. Have we gone back to the childhood again? - Yes, we are the children of the Indian forests and begin the first act of our lives as Indian Foresters.

After long school and college career we revert to the habit of wearing shorts and carry water-bottles on our back, which recalls the days of child-hood once we had spent in the same garments while attending the primary schools. We are taught — ' A mosquito has six legs' ; ' Tajmahal was built by Sahajahan' ; ' who was Napoleon '?, and what is honey? etc. It reminds one of the primary school days. Besides, just as the child is properly looked after by the parents,

we are also taught in the quarters 'How to keep our rooms clean'; 'How to eat in the mess'; 'How to use a hanger for the coat', etc. Again in the field we are taught 'how to buckle the pants', 'how to lace the shoe', etc., which generally mothers do for the children. We forget our past here and act as if we have gone back by 20 years physically and mentally. To cap it all we behave like children by quarrelling, fighting and even biting.

The childish behavi our is very much in evidence in Tours. It was a severe sunny noon we were in the midst of our tour. The bus that carried us stopped in a jungle track for a 5 minutes break. All of a sudden a beautiful flower in a nearby shrub caught my eyes. May be in the language of 'Moore' —

"This the last blooming rose of summer, left blooming alone".

Oh! At least one mark is in my pocket now, for it will be a good specimen to collect, so I thought. I got down from the bus and rushed towards the plant unnoticed that was what I thought. I was about to reach the plant. But lo! - to my great dismay a group of friends jumped from behind suddenly like hungry wolves and fell on that shrub and completely browsed it leaving behind the main axis alone.

Everyday during lunch hour, when our morning classes are over each one of us at that time becomes a Milkha, 'the flying Sikh of India'. He dashes from the class room to the dining hall at top speed, the finish ending with a hop-step or a broad jump to land accurately before the plate.

Though physically we have attained the age of 25, we start our studies all over again, playing the first act of life as children of Indian Forests.

If we are to stretch Shakespeare's imagination we are still in the childhood stage i. e., the first act of life in forestry. We like the wind borne seeds have dropped here from different corners of India and abroad and spend our seedling stage here in a microdimate very much different from other colleges. During these two years we are tended, pricked in different nursery beds under various adverse conditions. It is a process of hardening — that is what we are told. After two years we are transplanted in different places.

We have enacted childhood in our youth. Will youth come again?

My Visit to Flamingo City

AMAR SINGH P. JETHWA,
1963 — '65 Ranger Division.

Before I joined this College I was entrusted with the task of watching the movement of flamingoes. Flamingo is one of the typical migratory birds and has got wide distribution throughout the Indian Union, Pakistan, Ceylon and Burma. In India they are found in the Rann of Kutch.

The Rann of Kutch, which extends over 50 lakhs of acres, is divided into the Little Rann of Kutch and Great Rann of Kutch. The former is situated in the east and the latter in north of the district. The district of Kutch is the greatest district covering 17000 sq. miles area out of which 9000 is the Rann. The word Rann means desert. This is a flat ground, more or less level and consolidated due to frequent inundation. In monsoon, river Bannas and other smaller rivers spread their water and the entire area look like a big lake. Ultimately this vast sheet of water merges with the Arabian sea. The flamingo breeds only in the Great Rann of Kutch and that too at safe places near hillock, Bhangde which is formed of Jurassic rock.

The District receives only 10″ to 15″ of rainfall during July—August. Rest of the year is dry and hot too. The water in Rann dry rapidly during hot months. No vegetation is noticed except some thorny spp. So over this vast area there is no shelter nor water to drink.

The route to reach the city of flamingo is a difficult one. The capital of Kutch is Bhuj. There is a road from Bhuj to Khavda about 46 miles. Khavda being a border place and military headquarter has good roads. But now bus service is available twice a week and that too in fair weather. During monsoon season one should go on camel or on horse. Khavda is a Mahal — a small Taluk on West Border of India. Mahalkari's office is the only source of information. There is a Flamingo warden but he stays just on the fringe of Rann. This location enables him to observe and note down the minute

movements of flamingo and convey it to Mahalkari's office. But it is 25 miles away in a remote area. There is no track and camel is the only conveyance. I had been supplied with a camel and it was my first chance to travel on camel! I remained there for six months. During this time I was regularly visiting the area and information was sent daily to District office and Natural History Society.

I had golden opportunity to meet Mr. Salim Ali, the Naturalist, the well known author of Indian birds and birds of Kutch and the chairman of Natural History Society, Bombay. At that time I was also informed that the late Prime Minister, Jawaharlal Nehru, was also interested to visit "the city of flamingo". To watch these birds during the breeding period is of great interest. Sri Salim Ali tied rings on the legs of young ones marking the place and time in order to study its migration to different places. The birds are migrating purposely to the Rann of Kutch for the breeding after a good rain. They visit from August–September and stay until they found suitable depth of water in the Rann. The Rann of Kutch is a unique place for breeding and nowhere its breeding is noticed, in India. His Highness of Kutch had promised to supply regular particulars to the Indian Board of Wild Life and other related institutions from the very begining and it was continued by the State Government. Even yet Maharaj Kumar Sri Himat Singhji is much interested in the subject and help those who approach him. I had the opportunity to meet him with Mr. Salim Ali.

During 1958–59, due to lack of rain rain, the breeding had not taken place, though millions of birds had visited the Rann of Kutch and stayed for long time. There was a plan to take a movie picture by camping there, but it was not possible that year.

Flamingoes come in millions and it is a sight to see the white horizon against the blue sky in the great Rann of Kutch. Their number is greater than the population of Bombay. Coming to nomenclature it is *Phoenicopterus — Roseus Palleas* in Latin, Raj-hans in Hindi, Surkhale in Gujarati and Hanj in Kutchi, local language.

It is like a domestic goose standing 4′ high. Legs are very long brightly pinkish. Neck is also comparatively long just like goose with a broad head and a jointed bill with a heavy pink colour and turned down. Neck is rosy white. The wings when stretched are of pleasing rosy colour and have a dark brilliant scarlet which add much to its beauty. They fly in parties of flock of hundreds. Both sexes look alike. Big flocks make much noise when fly. They have comparatively good speed and travel thousands of miles in night and take rest in day time nearby jheel, lagoons, salt-pans, estuaries etc.

They feed in shallow water. While feeding, they bend their slender neck down and keep it between their legs. The bill scrapes the ground and take in some muddy water and mud, locally called Rar. Rar is collected with its inverted bill and kept between two legs. They also feed upon small worms, insects, crustaceans and some times on seeds of marsh plants and organic ooze.

Breeding time is very peculiar. They fly here and there making constant babbling. From the loud noise one can know the breeding season. The nest is of special type. They form mound about $1\frac{1}{2}'$ to 2′ high from ground level having conical shape and partly submerged in water. The nesting season is September/ October or February/April. The nesting take place only when they find that the *adequate quantity of water* will last for atleast 6 months — the period enable the young one to fly. They lay 1 to 2 eggs in slight pan-like depression at the top of nest. The egg being similar to the peacock egg but have a faint bluish tinge and slightly small. I collected one egg which was kept in "Museum of Kutch".

Nests are formed which are similar to our colony, having equal distances between two nests and in the same line. The flamingoes are accompanied by other birds which are aquatic in habit making the job of "Santri". They prefer walking more than fly when in water. But at the time of breeding they never leave the nest and rather prefer death to going away. They protect their young ones.

I had come to know that certain shikari, usually back-ward class people used to shoot them and feed upon them. During my stay, the practice was totally stopped. The percentage of fat is more when compared with others. Other enemies are jackals, wild dogs and kites. The considerable slaughter is done at the time of breeding. The quantity of water become less and shallowness of water is no problem for other animals. When the bird is attacked they make a horrible babbling which can be heard from the great distance. The sound will be like "honk"......honk....... The birds are sensitive. When we approach them they walk away quicky and will be out of vision. In the early morning or late in the evening the scene of their congregation is very pleasing. They start their activity in the early morning, the entire crowd waking up like a lotus opening and praying the Sun God. It is a marvellous sight and an unforgettable experience.

Reference: Indian birds by Salim Ali.

CONSERVATION

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President John F. Kennedy, in his conservation message to Congress (1962) has aptly defined conservation thus, "Conservation .... can be defined as the wise use of our natural environment: it is, in the final analysis, the highest form of thrift — the prevention of waste and despoilment while preserving, improving and renewing the quality and usefulness of all our resources" — soil, forest, water supply, minerals, wildlife and resources of scenic and scientific value — for a healthy and satisfying life, both for ourselves and for those yet unborn.

The age of the earth is assumed to be about two billion years. To begin with there was the general order of world evolution. As the initially hot earth cooled down, one of the gases in its atmospheric envelope began to condense and liquid water occupied the lower portions of the surface of the globe; the higher portions remained above water level. Thus arose the oceans and continents. The remaining circulating atmosphere continued to absorb water from the oceans and brought rain on the continents. The sun shone between the rains and warmed the land surfaces. In this warm, moist and stable environment plants and animals evolved and multiplied. The dead remains supplied the land surface with organic material. True soils were thus formed. Because of mountain-forming, ercsion, sedimentation etc., the land surface increased in complexity. Soil, claimate, temperature, rain and sunshisne varied from place to place. As a result, the vegetation of the earth evolved differently in different regions. In turn, various species of animals dependent upon different plants for food and shelter, accomodated themselves to this varied vegetation pattern. The original land scape thus varied from place to place. Everywhere, however it contained the same interdependent, basic components. Climate controls the development and distribution of plants, animals and soil. All species have definite moisture and heat requirements and the rate of weathering, organic decay and leaching in soils are influenced by the same climatic elements.

On the other hand, climate itself is influenced by the nature of the vegetation cover. Vegetation controls the distribution of animals. Each animal lives in the vicinity of the plants upon which it feeds or, in the case of a carnivore, in the neighbourhood of its prey which, in turn, is governed in its distribution by vegetation. Conversely, the fauna exerts some effect on vegetation. Large herds of wild ungulates, because of their selective grazing, favour some plants at the expense of others. So also, there are reciprocal relationships between soil and fauna. This complex interacting phenomena is called the 'biotic complex' or 'eco system'. Man (Homosapiens) walked into this wild complex relatively recently.

In early days, man wandered and collected wild fruits, leaves and roots and preyed upon other animals. Then his impact on the world was not much in the sense of the world to support him. If food was scarce he just shifted to a new area, leaving the old one to recover, Soon he domesticated grazing animals. He changed the vegetation over vast areas of forests by periodic firing and pasturing those animals. Fire and grazing resistant plant species alone survived in those pastures. The pressure on his environment grew. He escaped the consequences by turning nomadic. There was competition for land, and men fought ruthlessly. This warfare thinned out both the herds and the herdsmen and led to the building of towns for defence and to keep agriculture. It is now believed that the first cultivation of land for crops was about 10,000 years ago. It probably began with spot planting of individual seeds. He used the antlers of deer or branches of small trees for scraping over the earth and as his technical skill developed he carved clearings out of the virgin forests and thickets by cutting with axe or by the deliberate use of fire and plied his spade and plough for farming and agriculture. Later on towns grew with great division of labour and with expanding agricultural areas to supply food. During this period in the history of man, local scarcity of natural resources, over-use, soil erosion and man's impact on his environment crept in.

By now, man gained some intelligence. He could discern causes with effect and get benefit from experience and device measures to alleviate shortages. He developed certain customs and manners based on relegious beliefs. Some iteme were reserved for Kings and nobles. Estates and game parks were owned by them Some sort of protection of forest and forest exploitation was there, but regarding relationship between forests, floods, land slides, soil losses lowering of water-tables etc.,

were not understood. People believed that natural resources were superabundant and inexhaustable. Some people developes ways oj frugality and avoided waste, but many exploited their resoueces relentlessly, depleting their environments.

Over vast areas, forests have been replaced by much less demanding vegetation. All though climatic changes may have been responsible for some of this deterioration, there is conclusive evidence that many dusty unproductive semi-deserts have been brought into existence by man's long continued activity. Earlier in human history entire civilizations in Central and South America, the Mediterranean regions, in Africa, the Middle East, the Far East and coming nearer home the ancient civilizations of Mohanjo Daro and Harappa in the Indus valley were wiped out as a result of misuse of forests through shifting cultivation, overgrazing by cattle, burning and unregulated removal of forest material.

Although extensive areas of tropical rain forests have now been cleared or modified, recognizable tropical forest can still be seen, for example, the Western Ghats in India; it is only in Ceylon, Java and some of the Pacific Islands that almost complete obliteration has occurred. Many of the first cultivators made tiny clearings in the forest, raised a series of crops in the sunlit soil and after some time moved to another spot, allowing it to recover through natural regeneration of species that were cut. But increase of population and advent of large-scale plantation type agriculture has been responsible for the depletion of these forests and formation of hard lateritic crust with xerophytic or secondary forest growth, e. g., forests of China, the forests of Southern Italy and other Mediterranean lands and the great forests of Central Sahara and Nigeria. The famous cedars of Lebanon were wiped out some 3,000 years ago leaving one or two specimen patches in their memory. Over great stretches of low lands and foot hills in Malaya, for instance, it is difficult to find true primary rain forest. In the Asiatic — Australasial zone, deciduous seasonal forest very similar to that of South and Central America once covered very large areas. Much of it has now been removed or greatly reduced in Indian and Southern Burma. The region of grass and desert which extends Eastward from the Atlantic across Northern and South-Western and Centeral Asia and beyond has been greatly over grazed, a process that continued up to as early as Neolithic times (new stone age). The plant cover was thinned and desert vegetation took its place. Thus there was a notable deterioration of the natural resource base. Land deterioration in Palestine was considerable. Three feet of soil material have

been stripped from the uplands of Palestine since the break down of terrace agriculture. Bare bed-rock is at the surface of the ground over wide areas. Man himself was responsible for the disafforestation for the cultivation of steep slopes and for the overgrazing by goats which made reafforestation difficult if not impossible. Goats have been a major scourage in the Mediterranean region.

Depletion of natural resources was hastened in the 19th and 20th centuries. Almost an age of extermination started. So severe was the impact of man on the environment and utilization of resources that it aggravated demands for conversion of soils and forests into agricultural crops, timber and other products. Much timber was used for building, fencing and in the smelting of iron and quite a lot was cut down for use as domestic fuel. Slaughter of wild life for food and sport together with competition for its habitat by domestic animals threatened native animals everywherc. Misuse of land by firing, felling, logging, mining, overgrazing and over farming brought erosion and destruction of topsoil and microclimate near the surface of the soil, water courses and depletion of soil nutrients. Rich mineral resources were exhaustcd or diminished by long continued use. Fisheries declined because of overfishing.

The age of intense exploitation was really inaugurated by the machines of Industrial Revolution in Western Europe. Here-tofore, population grew at a fairly rapid rate and the process of destruction was intensified as western civilization, spread over the earth. The entire world was brought under the influence of the industrial powers. All of the colonial lands were partitioned among them and tha various commercial regions of the world have been specialized for world trade–although a counter movement has now placed national markets ahead of world wide trade. The two world wars which hastened depletion of world's natural resources, have been instrumental for industrialization, The effects of the wars are far reaching. In the old lands of the world the fertile soil was laid bare. In new countries crop production was speeded up regardless of the best long-run use of the land, on account of high price for grain. Forests were cut at a rapid rate in Asia, Europe and U. S. A. The Second World War had brought Canada almost to the end of the nature planted and tended forest. Forests in Australia and India were also damaged. Minerals were drawn on as never before. In 1942 the United States mined some one hundred million tons of high grade iron ore. The loss of of metallic equipment during the war was disastrously large because so much was located in geographic areas beyond the limits of economic transportation or was sunk at sea.

As this pattern developed, some people, especially in the industrialized regions grew anxious about the hastening signs of loss of natural resources and the decline of the once beautiful environment of man. They needed remedial action. A general word came into use for such action. This is 'Conservation'. Early in 1864, George Perkins Marsh, in his book 'Physical geography as modified by Human Action', which became a conservation classic, pointed out the danger of human enterprises that "interfere with the spontaneous arrangements of the organic and inorganic World" and the need for "the restoration of the disturbed harmonies". He said, "The ravages committed by man subvert the relations and destroy the balance which nature had established ....; and she avenges herself upon the intruder letting loose her destructive energies .... When the forest is gone, the great reservoir of moisture stored up in its vegetable mould is evaporated .... and .... the whole earth, unless rescued by human art from the physical degradation to which it tends, becomes an assemblage of bald mountains, of barren, turfless hills and of swampy malarious plains. There are parts of Asia Minor, of Northern Africa of Greece, and even of Alpine Europe, where the operation of causes set in action by man has brought the face of the earth to a desolation almost as complete as that of the moon ...... The earth is fast becoming an unfit home for its noblest, inhabitant and another era of equal human crime and human improvidence .... would reduce it to such a condition of impoverished productiveness, of shattered surface, of climatic excess, as to threaten the depravation, barbarism and perhaps even extinction of the species".

John Perkins Marsh urged land owners to reforest the exploited woodlands in recognition of the "duties which this age owes" to the next and raise shelter belts by planting trees to arrest the force of wind and protect the soil to stop killing song birds, snakes as eaters of rodents and inseects. He knew forests as watersheds help maintain the flow of springs and also replenish the ground water. Thus how, Marsh flashed all the modern ideas of conservation of soil and water and forests and their close relation with one another and an effective equilibrium between forests and agricultural lands.

Conservation in modern times has come to be one of the higher motivation of man — comparable with the tenets of democracy and loyalty to the nation. The need of conservation of natural resources has been realised by all nations in the world and the concept of conservation is fast expanding to meet the imperious problems of the new age.

Material resources are classified as the renewable and non-renewable and the problems and approaches relating to their conservation are widely different. Among non-renewable resources some can be used by consumption, others, by enjoyment as they are, without change. Between these two classes, again, conservation is achieved by quite different means. Natural resources that are consumed when used are ultimately all in limited supply, either great or small. When the supply is exhausted nothing can be done about continued use. If they are to be conserved, they should be economically utilized and for essential purposes. Resources that are of value in an unaltered condition are conserved by protection and preservation.

Things that are lasting benefit through aesthetic or contemplative enjoyment, through educational or scientific value, or because they do a protective function, often present difficult problems. Economically the gain from their preservation may not equal that to be derived from destroying them. It may be argued like this. Is a magnificent tree of more value growing, as a thing of beauty, or cut down, as timber? It may be more difficult to decide if a beautiful canyon is more valuable by construction of a dam over it, as a continuing source of electricity or irrigation, or in its natural state, as a source of inspiration, spiritual exhilaration and out-door enjoyment. The economic value may be derived by some individuals. But the aesthetic values and the precious freedom of woodlands, meadows, strips of sea-shore and stream valley are enjoyed by many for all time. Certain accessible forest lands containing hills and dales, lakes, rivers, water-falls, scenic roads, hiking trails, scenic spots commanding beauty, majesty and grandeur are quite desirable to-day, especially in the vicinity of urban centres. Harmonies between man and nature will always evoke admiration and satisfaction from visitors. In some cases forests and the grass lands associated with them in nature afford protection which they alone can render, for example, protection against desiccating effects and erosive action of winds; protection in mountain regions against avalanches and rock falls; protection of springs and the steep bank of water courses, the stabilization of sand; and perhaps even an improvement in the purity of air in the vicinity of towns. Such areas are to be retained under natural vegetative cover for protective purposes. The only way to conserve resources of this nature as a green legacy for centuries is to preserve them by arbitrary decision without regard to economic values. Otherwise the few remaining areas where vegetation, soil and fauna can still be seen in a wild, unmodified state, will finally vanish.

Scores of plant and animal species have become extinct in relatively recent times because of human activities. Their loss is irreparable — they can never be restored.

Mineral resources are exhaustible, non-renewable and limited in quantity. They were formed under physical conditions during geological periods of such great duration. Our material culture depends on them. In 1600 only some twenty minerals such as iron, copper, tin and silver were mined. Now, more than eighty substances such as nickel, aluminium, chromium, magnesium, uranium, industrial diamonds, Quartz crystals and tungsten are extracted. Electricity, natural gas, petroleum, coal and the application of new techniques have been stimulated by wealthy countries. The mineral resources are now sought out at an accelerating pace to feed the factories of peace and war. Commerce has stiualted the rise of big cities and has supplied them with products of the forest, soil, sub-soil, drawn from all parts of the world.

Mineral resources after taking a correct inventory of national scope and geologic mapping are to be conserved by utilizing them economically and efficiently. National problems are more pressing in regard to the fertilizer minerals, the metals and the fuel minerals. In view of the unforeseen technical developments, the fossil fuels — coal, petroleum and natural gas — are still to be treated with some economy plus a proper regard for the rights of the coming generations. As a measure of conservation many synthetics and substitute products are introduced. Within its limitations one metal may be replaced by another. Aluminium is substituted for copper as an electrical conductor and aluminium or iron and copper in cooking utensils. The scarcity of ferro — alloy elements during the war resulted in some substitution. Some important alloying elements as nickel, chromium, beryllium, Tatanium, vanadium and manganese were conserved to produce steels of low alloy content with essentially the same properties as steels containing larger amounts on these elements. Research work is substantially increased recently. Already magnesium and the halides (iodine and bromine) are extracted in commercial quantities from the seas. The supreme conservation achievement of this century is the fashioning of an almost self-renewing source of energy from atom and thus allaying fears of fuel shortage. House-cooling by means of solar energy appears to be hopeful, especially in hot countries. Solar

cooker has been introduced in India and it might save animal manure which is burnt for fuel but could be used for fertilizer. But the main interest in solar energy is in harvesting it for power.

Certain resources, such as forests, water supplies, wild life, soil fertility can be replenished or renewed if properly managed and not over-used. It is mainly in relation with them the definition of conservation as 'Wise use, arose. For example, if water is used from a ground water body or aquifer faster than it is recouped by infiltration or increased run off, a shortage will result. But if use does not exceed infiltration and the catchment area is protected by forest to retain absorbing capacity, the aquifer is sure to yield a perpetual supply of water. The objectives of river water conservation are to guarantee water for essential serviced as a home for fish and other aquatic life, recreation and scenery and to minimise the harmful effects of floods to human life and property. The thin layer of silt deposited annually on the bottom lands along the Nile in Egypt has been beneficial, but the dangers from the flood elsewhere are heavy. Water needs in rural and urban areas have mounted, too, as running water is provided for homes and as irrigation and electricity projects are expanded, as the keystone of the conservation efforts. Water conservation must always be primarily a public endeavour. Likewise our efforts to control stream pollution, the disposal of radio active waste which are a threat to public health must be enlarged and intensified in industrial, agricultural, and urban centres. Our air and water resources are essential to life.

Soil, if only non-leguminous crops are raised and not fertilized, soon loses its fertility and the crop yield decreases. If soil surface is unprotected, it erodes and becomes unfit for agriculture. Decline in soil fertility is an everlasting threat to the productivity of the alluvial plains of monsoon Asia. Erosion, leaching crop removal, stubble burning and oxidation all contribute to the loss of plant nutrients. In India about 200 million acres suffer from soil erosion. However, if proper rotation with leguminous crops (with bacteria in the root nodules which convert atmospheric nitrogen to nitrogenous plant food) is practised, animal manure is put and the soil surface is protected from erosion, yields may continue to improve and increase. In India, the farmers do no use enough cow-dung as manure and fertilize their lands. It is estimated that in rural areas, some 2,000 million tons dry weight of cow-dung are burned every year,equivalent to 3,300 million cubic feet of firewood. That is indeed a collosal waste of good manure. We must safeguard humus and the living organisms in the soil as well. Chemical fertilization is not

emough. The maintenance of soil fertility has grown steadily in social significance as new lands are getting scarce. Land reclamation aims to add to the acres of cultivated land immediately, but it has also come to serve national self-sufficiency. Both drainage and irrigation should be thought of as phases of the conservation of land, water and related resources.

Many countries have set out to reclaim lands and develop dams and power projects. There is top priority for soil conservation in Israel. Contour farming is introduced leaving the traditional straight line so that flood water can sink into the ground or follow safe channels instead of tearing up the land. Grasslands are reseeded. Dams are built to impound water. Tree plantations are reseeded. In India land reclamation and irrigation and power projects work is taken up on a large scale. Recently a team of American irrigation experts have reported that the soil and water resources of the Cauvery river delta in Madras State, although used in crop production for centuries, are being only partially exploited. The full exploitation of the potentials of the delta — its surface and ground waters and its soil and land resources — could effect a food production equal to that of Imperial Valley of California. Hydrological studies are of great importance to arid and semi-arid regions. The most influencial countries of the future will surely be those that bring desalted water from the seas to arid lands and use their scientific discoveries to advance the welfare of all mankind.

In recent years farming has been most productive, progressive and highly mechanized. We can produce from a restricted area as much food as possible, including cover crops, grass and hay, livestock such as cattle, sheep and poultry and their products such as milk, butter, cheese, meat, eggs, wool. skins and hides. Surpluses of some products are developed in some places. The rate of increase varies in different regions, and the benefits of agricultural progress still need to be translated into improved income to farm families, lower prices to consumers for food and fibre and expanded exports. There are many amenities to-day such as modern farming methods and machinery, soil testing, soil and classification as worked by specialists, reaping technique, assistance of field technicians in agriculture, laboratory knowledge for betterment of crops, fertilizers both organic and chemical, plant harmones, pesticides, improved strains of seeds and farm animals, better strains of grasses, cereals etc., transport, marketing and agricultural price supports. High yielding and disease resisting varieties of rice, barley, wheat, millet, pulses, beans, hybrid maize and hybrid jowar, sugarcane, cotton, coffee, cocoanut, spices the culture of new vegetables and herbs and the planting

of fruit orchards have been introduced in many parts of the world. Fertilizer consumption in India in 1955 was 128,000 tons and increased to 231,000 tons in 1959 and the target for 1965—'66 is 1,750,000 tons. Plant diseases and pest (with special attention to locusts) and diseases of livestock such as rinderpest, foot-and-mouth disease and anthrax have been brought under control. A grading system for fruits and vegetables, preservation and utilisation is established in many fruit growing countries and thus their wastage during seasonal periods of peak production is avoided. In Saudi Arabia, dates cultivated as well as wild are the most important product. Dates serve as staple food for many people and also as a feed for live stock — each donkey in Saudi Arabia is estimated to eat half a ton of date a year. Date tree also provides sugar, alcohol, timber for building, leaf-thatch for houses and fuel. Date export business is being improved based on choice fruit, handled by modern methods — sterilize the fruit, clean it with care, control the moisture content, and pack it by machinery in attractive packages.

Many countries have taken au initiative to improve live stock. Humped cattle of India and Africa, Camcosa of Egypt and Caracu cattle of Brazil are adapted to tropical conditions. Every country has its domestic animals, suited to local conditions through generations of survival. Recently the best native stock are selected and by careful breeding gradually built up a herd of flock with high productive capacity. European breeds and Indian and Pakistani types have been introduced in various countries and in crossing tropical and European animals considerable experience is gained. Good bulls are maintained for breeding while all others are castrated or removed. Artificial insemination is also being used to speed up progress. Thus selective breeding has produced cows giving larger quantities of milk and butter. The earlier types of cows produced 300 or 400 gallons of milk a year. Many cows to-day produce between 700 to 1000 gallons and some upto 2000 gallons. The average hen lays 120 eggs and many produce 200 or more per year. About a third will produce female chicks. Marino and such other varieties of sheep are reared.

In the latter part of the 19th century many landowners in many countries including India were good enough to replant with trees some of the land they owned and also the public owned lands in the neighbourhood villages, road strips, canal sides, Temple regions etc. Although they knew that they themselves would not get any benefit from their trees, except amenity values, they knew

they were planting for the benefit of posterity. Gradually many small areas of land became woodland and coppice. The timber thus developed was sadly depleted in recent times.

Again farm forestry is being encouraged by providing subsidy, organised tree festivals and free issue of suitable planting stock in rural areas where the existing forest is inadequate to meet agricultural and other needs. Extensive shelter belts have been raised over farm lands, in Canada, Russia, West and East Africa and Ceylon. By planting mulberry in villages in India, Japan and other countries, silk industry is developed. Lac is raised on some host trees in village wood lots. These industries provide employment to some villagers. There are 500,000 villages in India.

Some of dryland areas in the near East and the Mediterranean area and India have failed to become stable and self-supporting year after year due to uncertain rainfall and also drought, the tanks dry up, cattle and sheep are rushed to market to prevent them starving. For instance, in India, the present livestock population is 307 million. Over grazing is almost universal· Even some of the Himalayan valleys are in great danger of losing their greenery due to excessive grazing by sheep and goats which are taken to alpine meadows by graziers in April and May. The dryland areas should be devoted primarily to stock and that crop production should supplant live-stock production ralher than compete with it. The number of grazing animals should be limited to the capacity of the land. Grazing should be rationalised and uniform all over the area. Sheep graze well with cattle. Cattle graze on long grass and sheep nibble the short grass. The prime needs are controlled grazing, seeding with high yielding nutritive grasses like Guinea grass (Panicum maximum) and other leguminous forage plants, development of irrigated pastures and production of hay or ensilage to supplement range grass. especially in the dry season. It is worth-while to carefully collect the cattle manure and use it as fertilizer for growing more green fodder than letting burn it for fuel.

To-day, forests grow aud approximately a third of the land-surface of the earth. The area would have been grheater were it not for man's destruction of forests in the last few centuries, a mere sliver in geologic time. The World vegetation may shows certain distinct bands of forest types according to the prevailing climate, soil and water available around the Northern Hemisphere, Close

to the pole there is no vegetation. Away from the region of perpetual ice in the South is the Tundra belt where the soil thaws for some weeks in summer. It extends around the earth, through the Northern parts of North America, Europe and Asia. Large areas of the Tundra are covered by grasses, sedges, mosses and lichens and some dwarf tree groves of aldar, birch and willow. Lichens arc grazed by herds of caribou or reindeer which are hunted or domesticated by Eskimos.

To the South, the Tundra merges into a great belt of evergreen conifers — spruce, pine, fir, hemlock and cedar — where there is a larger growing season with often bitter cold. This great Northern forest particularly in the Northern hemisphere extends from the fjords of Norway across Russia to Siberia, then leaping the Bering strait and spreading much of Canada all the way to the Atlantic.

Along its Southern edge the belt of dark evergreen of Pines merges in its turn into another World-wide tree belt : the great Temperate zone deciduous forest of the United States, the British isles, Central Europe, and Eastern Asia. These are the forests of Western civilization bearing oak, beech and maple. To-day this vast area is occupied by farms and forests of lesser stature, for the virgin forests were ruthlessly cleared by man.

Ringing the globe around its mid-riff is a fourth major belt — the tropical rain forests of several types. Covering the warm and humilowlands are the tropical rain forests, which reach their greatest development in the New World. Central Africa and parts of India, South-East Asia and Australia. They contain broad-leaved species such as Ebony, mahogany and teak. Besides the rainforest there are the semi-evergreen forests' deciduous forests, scrub forests, and grasslands with scattered trees.

These global bands of native vegetation have within them a marvellous diversity of sub-zones and transitional forests. It is difficult to trace each of the different kinds on every continent. Man's interference with logging, fire and reforestation have mixed up even more.

The world forest areas are as follows:

		Area in millions of acres	Percentage of total forest area
Europe	...	348	38
U. S. S. R.	...	2,795	51
North America	...	1,811	39
Central America	...	183	27
South America	...	2,365	54
Africa	...	1,861	25
Asia	...	1,285	19
Pacific Area	...	237	11

The adequacy of the World's forests, as a renewable resource, for World population that might reach from the present 3,300 millions at the rate of 65 millions a year to 4,000 millions or more by 1980, only two-thirds of the World's accessible forests are said to be in use as sources of timber and other forest produces. For instance, India's present population of 470 millions at a growth rate of 10 millions a year may reach 600 millions in 1975. The total forest area in India is 302, 688 square miles (24%) out of which an area of 35,681 square miles is protection forest and the present annual production of wood is 579·3 million cubic feet. It is estimated that there will be a shortage of 100 million tons of timber and firewood by 1975 in India. This will create a tremendous pressure on its forests. Only the Soviet Union and the Scandinavian countries seem to have potentially adequate forest resources, considering the present state of technology.

Areas fit for permanent forestry must be managed intensively and get a sustained yield of the greatest quantity and the best quality timber and pulp wood and plywood and bring it up to the level of population. Forestry and industry must keep up the output of wood and all other produces derived from wood to actual needs, particularly in areas of the underdeveloped forests or of practically no forests at all where the population is likely to increase at a rapid rate in the course of the next few generations. In this connection, a long-term view of

timber production is needed. 50, 60 or 100 years is not too much to look ahead, for it may take such a long time to grow a new generation of mature trees. Shorter rotation may be fixed for quick growing softwood species.

The great task of conserving and replenishing the forests of the world and reclaiming the deserts like the Rajputana desert in India and the semideserts and deserts in Iran, Iraq and Syria and other waste spaces and badly eroded areas requires the conserted action of every country. A co-ordinated scheme of reforestation with species suited to the special conditions prevalent in arid and semi-arid and sub-desert regions will prevent the onset of the deserts and thus alleviate growing shortage of food. The reafforestation of denuded laterite soils of the tropics and alkaline soils of the arid zones with suitable species still present formidable problems. In Punjab (Pakistan) 3000,000 acres are ruined for agriculture or forestry. Management and improvement of mixed tropical rainforests both natural and artificial are still in experimental stage. Natural regeneration is induced by selection fellings and valuable species are raised by artificial regeneration.

Pulp and paper production were based on conifers such as spruce, fir, and pine but many softwooded broad leaved species and even hard wooded species such as Eucalyptus and Poplars also have fair possibilities. Even those small sized trees treated as waste are to be retained in the understory of forests to be removed by thinning for use as pulp. In some tropical countries bamboos, bogasses and grasses are used for pulp making.

By appropriate processing, such as seasoning, storage and preservative treatment, a large number of hitherto unknown tropical species could be utilized for construction, ship building and other purposes. There is a special method of gluining in a fluid thermic medium with simultaneous inpregnation to make large wooden sizes out of small dimensioned materials. Solid wood is giving place to processed materials with improved properties. Recent improvement in Plywood, chipboards and fibreboard manufacture have greatly enhanced the use of wood and the expansion of plastics, rayon and other chemical industries based on wood will surely cause wood to enter more and more into the manufacture of such chemicals as alcohol, acetic acid, methanol, wood molasses, resin and possibly sugar through wood hydrolysis. Recently many new plastics are in use in place of metal. Some of these plastics are of mineral origin.

The extraordinary strength and performance exihbited by planes constructed of bounded wood veneer and the remarkable properties of glass fibres when bounded with plastics indicate that they will become competetive with metals in some fields and their use will effect some conservation. About 4,500 uses of wood are listed. Wood is one of the cheapest source of organic materials needed in industry.

Minor forest products such as bamboos, cane, resin yielding plantss essential oils, medicinal plants, tannin yielding barks, grasses, lac etc., are in great demand. Of late, bark is used as an ingredient in plywood glues, plastics. insecticides and soil conditioners.

Afforestation with fast growing exotic species such as Eucalyptus and poplar are of considerable interest in many tropical countries including Mysore. Teak from Asia and Indonesia has been an important exotic in Africa during the last forty years. Tree planting has increased considerably since the second world war, More recently tree planting machines are introduced in level or gently sloping lands, but in steep topography hand planting is continued. Arid zone forestry in regions getting 20 inches of rainfall has gained importance.

Wild life is an important part of the forest complex and its proper treatment and maintenance are important to mankind. Both game and nongame species and those that are inimical to man's interest are included in this definition. The problem of wild life conservation has arisen because desirable forms of wild life have been excessively depleted during the past 150 years or so. It is now actually an ecological problem concerned with the conservation of wild life as a whole, with particular emphasis on species which are in danger of extinction or extermination, or might become so in future. Since 1800 about 44 species of mammals have become extinct and a similar fate of many varieties of birds. The classic example of extinction in modern times is that of Passenger Pigeon of North America. Earlier in the 19th century the number of these birds was estimated to be 5,000,000,000. Alexander Wilson in 1832 sighted in Kentucky a single flock in flight which was a mile wide and 240 miles long containing, he guessed 2,000,000.000 birds. This flock consumed about 30,000 tons of nuts, seeds and fruits. The birds occupied a whole forest of many hundred square miles for nesting, each tree bearing a hundred or more nests. But the White Settlers in America as in other parts of the world, slaughtered

them ruthlessly. Only one bird by name Martha survived in the Cincinnatai zoo and she too died in 1914 and her dead body is preserved in the U. S. National Museum. Among the mammals which have become extinct in recent times through man's activities are the Quagga and the Burchell's Zebra in South Africa and hunting Cheeta in India.

There were 60,000,000 bisons (*Bison bison*) in the great plains of North America. The big kill began soon after the end of Civil War, Luckily some remnant herds escaped the hunters in yellowstone and in Canada. In 1889 there were only 541 bisons. Their descendants remain to-day on a few western wildlife refuges and their total population exceed ten millions.

In Asia all the three species of Asiatic Rhinos have suffered in the past and still suffer from the belief in the medicinal and magical properties of various parts of their bodies, chiefly their horn. In 1904 it was estimated that about a dozen great one horned rhinoceros (*Rhinoceros unicornis*) in the in the Kaziranga district of Assam and fewer than this in Bengal. Their present population is estimated to be 400. In Nepal their number from 1000 (1953) was reduced to 285 in 1959. Javan rhinoceros (*Rhinoceros Sondiacus*) also called lesser one-horned rhino whose range extended from Northern India and Southern China through South East Asia to Sumatra is believed to be extinct to-day everywhere except Java where its population is estimated between 24 to 80. Sumatran rhino (*Didermocerus Sumatrensis*) also called the Asian two horned rhinoceros is the smallest of all the five existing rhinos is very likely to be extinct in the near future. Its range extended from Bengal and Assam right through Burma to Sumatra and Borneo. It no longer exists in India or China. In 1959 there were about 40 Sumatran rhinos. The present population is not known.

In 1900 in the old State of Junagadh there were about 100 Asiatic lions (*Panthera leo Persica*). They are now protected in Gir forest and their present population is 300 or more.

Przewalsk i's Mongolion wild horses (*Equus caballus przewalskii*) in Whipsanade zoo, now generally recognised as the last true wild horse left in the world, could claim the sad distinction of being the world's rarest wild mammal. About two dozens are surving in Munich and Prague.

The other mammals and birds that are threatened with extirpation in many parts of the world are the following Sea mammals: Sea otter (*Euhydra lutris*) in Alaska and Alutian coasts; Fur seal (*Otaria ursina*) in the beaches of St. George Island and St. Paul Island; Elephant seal in South Georgia; Stellars' sea cow in Bering Island; Walrus (*Odobenus rosmarus*) of the arctic seas and coasts.

Land mammals: Musk ox (*ovibos moschatus*) in the arctic waste of North America and Greenland, European bison (*Bison bonasus*) in Poland, the Wild elephants (*Elephas maximumus*) in Ceylon; Browantlered deer (*Cervus eidi eldi*) in Manipur valley in India; Kashmir stag or hangul (*Cervis elaphus hanglu*) in Kashmir; various kinds of Chinese and Formosan sika deer and Pere David's deer in China; Musk deer (*Moschus moschiferus*) in Southern China and Tibet; lorida key deer (*Cdocoileus virginianus clavium*) in the Florida keys region; Okapi (*ocapia johnstoni*) sole relative of Giraffe — in central Africa; White-tailed gnu (*Connochaetes gnou*) in South Africa; Arabian Oryx (*Oryx leucoryx*) in the Middle East and particularly in Saudi Arabia; Red lechwe, and antelope of Northern Rhodesia; Wild goat of Crete; Koala bear in Australia; Giant kodiak bear (*Ursus arctos midden-dorfii*) — brown in colour — in Kodiak Island near Alaska; Polar bear (*Thalarctos maritimus*) in Canada, Greenland, as well as in Spitzborgen and other extreme Northern parts of Europe. Rare birds: Kiwi in Newzealand, America whooping crane (*Grus americana*) in Texas; Hawaiian goose (*Branta sandbicensis*) in Hawaii Islands; the great Indian Bustard (*Chorbtis nigriceps*) in India.

Wild life can be destroyed, It cannot be recreated. It is a known fact that the balance between man and beast, between life and death has been maintained through the centuries and by a force which even in this atomic age nothing can be substituted — neither can this force be defied. To-day greater efforts are made to increase the depleted fauna as a definite asset. The study of local wild life, their habitats provided by the actual land or water area occupied, their breeding habits, feeding requirements, fluctuation in population levels and rates of restoration provide valuable field experiences. Preservation societies and similar bodies are founded in many countries and their efforts are now co-ordinated by the International Union for the Conservation of Nature. Enlightened propoganda is enlisting increasing support for this work both from governments and from the public. Wild life conservation is undertaken in many parts of the world by maintaining wisely chosen, properly administered and ecologically suited Nataional

parks, game preserves, Wild-life sanctuaries or refuges, zoological parks or even zoos, some of them small but others of considerable sizes and resting grounds for migrating species, for research, education and aesthetic reasons.

It is not known who was the first man to catch and eat fish, raw or cooked. Perhaps the primitive man caught them by spearing or netting. To-day fish is an important diet. Fish refuse is used as manure and also converted into a high grade fish meal and used for the enriching of animal feeding staff. Cod-liver and shark-liver oil is widely used to improve the health of all livestock and the meat, milk and eggs they produce. There is oversea market for inexpensive processed, surplus fish, herring products suited for Africa, edible fish flour rich in protein, smoked fish, fermented fish sauces or pickles, salted dry fish in the Far East, fish condiments or paste in South-East Asia.

Modern fishing trawlers and clippers equipped with the latest fish-finding and navigational devices and better basic facilities such as harbours, wharfage, storage plants, expeditious cleaning, curing, processing and packing, transportation, marketing, speedy distribution of well conditioned fish and the stimulation of public interest in fish as good and healthy protein food have greatly increased the intensity of fishing in streams, lakes, ponds, brackish waters and seas and enlarged the area that could be exploited economically.

Commercial fishing is highly developed in Europe. Ninety per cent of all fish caught in the world are caught in the Northean waters. Many nations share fishing in North sea. The chief varieties of fishes are eel, herring, mackerel, halibut, cod, salmon, haddock, Turbot, Sardine, Trout etc. But some of the world's best fishing grounds apparently lie in the equatorial belt. Tuna, bonito, albacore, barracuda, marlin, herring and other large fish are found here.

Indo-Pacific Fisheres Council aided by F. A. O. has encouraged fishery in Far East, Malaya, Hong kong and India. Inland fish culture has been taken up in India, Indonesia and Java.

The whaling industry is of immense importance to the economy of many nations for it supplies large amounts of food for men and animals and also fertilizers. Whales of North Atlantic and Antartic oceans are generally preferred.

Technical innovations are now subjecting marine resources such as fish, whales etc., comparable to that which land resources have long experienced. Unfortunately the basic scientific data required for sustained yield management are still inadequate. Most fisheries have definite geographic limits and some marine fishery resources however, are not so localized. Whales provide the best example of a world resource which has come close to extinction through vigorous exploitation. It is difficult to secure co-operation of various nations. Nevertheless, there are notable examples of conservation of marine resources based on the requisite scientific data and on international conservation agreements. These achievements point the way to evenual sustained productivity of marine and river fisheries at maximum levels and regulated exploitation.

A salient featuera of the Japanese se food is the exclusive use of marine algae, which are not commonly eaten, by other people of the world. About 1200 different species are found in the coastal regions. The chief algae that are utilized as food stuffs are the brown algae (*Laminaria Japanica*) green algae (*Enteromorpha prolifera* and red algae (*Glidium amansii*). Japan consumes 340,000 metric tons of marine algae per year. Possibilities of the use of marine algae as fodder for cattle or poultry are also being investigated by scientists.

Basically, conservation is an aspect of applied ecology. Man himself is a pioneer species, with a tendency to increase rapidly and to destroy his habitat, to render it incapable of answering his needs ounsuitable for his physiologically or psychologically. Conservation tends to prevent these destructive tendencies. Of course, if human population increases especially geometrically, these efforts are sure to fail as there will be no room left for expansion in another hundred yearse Therefore, one of the basic ecological needs and the sine quonon of long term. conservation, is to check this increase before the carrying capacity of the habitat is exceeded. This is needed to preserve human society even at a level of bare survival. Many thoughtful conservationists do not advocate the mere survival of the human race at a minimum level as a satisfactory prospect. They think that modern science can so greatly increase the productivity of existing resources that there is no cause for alarm. Both groups agree that large scale wastage of resources must be halted, if disaster is not to overtake human race. The present population of the world, along with a substantial increase could be maintained from the land it now occupies, if human effort were dedicated to the intensification of agriculture and forestry and the increase of manufacturing industry.

In recent years, substantial conservation activity as well as creation of new forests, raising the productivity and fertility of areas already under cultivation and the newly reclaimed areas. improvement of live stock and fishery, protection of fauna, scientific use of minerals, fuel and energy is evident in many parts of the world. The modern American record in conservation has been brilliant and distinguished. It has inspired comparable efforts all around the earth. Every nation has adopted certain definite policies and balanced conservation programme with the aid of specialists and scientists and conservationists and conservation statesmen to safeguard and develop its rich and varied natural heritage. The United Nations is associated with 100 countries and territories and the U. N. technical agencies — F. A. O., U. N. R. R. A.; U. N. E. S. C O.; T. A. B.; W. H. O.; I. L. D. and others — are committed to the doctrine of a "wise use" of world resources and to provide people with greater and permanent supplies of food, clothing and shelter and full employment and fair standard of living and to establish peace and prosperity and ultimately to preserve the beauty and bounty of the life-giving environment for ourselves and for generations to come. So shall they all succeed and all nations be one.

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Sports Roundup

"KAYSHAN '

As in the past, the College associated itself actively in the tournaments conducted by the Coimbatore Collegiate Athletic Association in the different games. Our performances were generally good, the most outstanding being the crowning of R. K. Ghana, a student of this College, as the champion Athlete in the annual Inter-Collegiate Athletic meet held on 27th & 28th November 1964. It is well over three decades since this distinction was achieved by a student of this College.

HOCKEY :

Our team captained by G. S. Pardeshi (Madhya Pradesh) did exceedingly well though the team had to withdraw from the tournaments due to reasons that were not wholly creditable. Qureshis (S. A. and A. K), Ganesh Iyer, Shantwan, Scott and Adinarayana along with the skipper himself, were the outstanding players.

CRICKET :

It was very lean season for the college cricket team. S. B. Shetty (Gujarath) led the team while Ganesh Iyer and Kapuria were the best performers with the bat and ball respectively. Our Annual festival match played on 15th August 1964 ended in a draw.

FOOT - BALL :

The team led by S. A. Qureshi played a few matches during the year but not with any outstanding success. Das, Nayak and Preeyagreisson (Thailand) were among the best of the footballers of this College.

VOLLEY BALL :

The Volley ball team put up creditable displays in the matches that were played. R. G. Sisodia (Captain = M. P.), R. K. Ghana, S. Das, R. D. Harikanth and Kadiresan acquitted themselves well.

TENNIS :

The Fischer Cup was won for the second successive year by R. Ganesh Iyer (M. P.), the captain of the College Tennis Team. Ram Mohan was the runner-up. Ganesh Iyer and Masood Alikhan won the doubles beating Ram Mohan and partner in the final.

Edwin Jeyaraj (Madras), K. K. Kuruvilla (Gujarath) and H. Govinda Rao (A. P.) were the captains of the Athletics, Basket Ball and Badminton teams respectively of the College.

ANNUAL SPORTS :

The annual Athletic sports of the College came off on 11th January 1964, when Wing Commander J. W. Fenn, Station Commander, Air Force Station, Sulur, presided and took the salute. The programme commenced with a smart march past of the athletes led by V. N. K. Scott (Madhya Pradesh), the General Sports Secretary. The meet which was largely attended, provided an interesting fare with keen competition among the participants. R. K. Ghana (Orissa) was the outstanding athlete, winning the Richmond Cup, and setting a few records in the process. The results in the various events are as following :—

100 meters race	1. M. K. Raykar 2. R. Ganesh Iyer
200 meters race	1. M. K. Raykar 2. G. M. Raut
400 meters race	1. G. M. Raut 2. K. J. Charles Wesley
800 meters race	1. R. Ganesh Iyer 2. R. K. Ghana
1500 meters race	1. V. Sambasivan 2. G. P. Rathore
110 meters hurdles	1. R. K. Ghana 2. M. K. Raykar
Putting the shot	1. R. K. Ghana (33′–4½″) New Record 2. Edwin Jeyaraj
Discuss Throw	1. R. K. Ghana (91′1″) New Record) 2. S. K. Kapuria

Hammer Throw	1. S. K. Kapuria 2. R. K. Ghana
Javelin Throw	1. R. K. Ghana — 156 '2" New Record
Broad Jump	1. R. K. Ghana 2. M. K. Raykar
Hop Step and Jump	1. M. K. Raykar 2. R. K. Ghana
High Jump	1. R. K.Ghana 2. Edwin Jeyaraj
Pole Vault	1. M. K. Raykar 2. C. S. Virkar
3500 metres Fast Cycle Kace	1. R. K. Ghana 2. K. J. Charles Wesley
Slow Cycle Race	1. D. K. Singh 2. J. R. Mahambrey
Sack Scrimmage	1. M. R. Pattanaik 2. G. M. Raut
Fancy Dress	1. B. D. Kuber 2. N. Kulkarni
Children's Race (Boys)	1. R. Ramakrishnan 2. C. Sivanandham.
Children's Race (Girls)	1. C. Kasthurithilagam 2. B. V. Thara
Class IV Staff Race	1. Bommannan 2. Achuthan.
Class III Staff Race	1. R. Sarvanan, 2. A. Subramaniam
Gymkana	1. Mrs. Fenn & Mr. K. M. G. Gounder 2. Mrs. Peter & Mr. Joseph
4 + 100 Inter-Divisional Relay	1. Senior B Division 2. Senior A Division
Tug-of-war	1. Junior A Divison 2. Senior A Division
Invitation Relay	1. P. S. G. Arts College 2. Suburban High School
Pentathlon (Uberoi Cup)	R. K. Ghana
Sankunni Menon Cup for the best House in track and field events	Dutta House
Seetha Bai Rolling cup for the best House in Track events	Dutta House

Sports over, Shri M. B. Peter welcomed the gathering and Mrs. L. Fenn distributed the prizes. The Function came to a close with the Vote of thanks proposed by Sri S. N. Krishnamurthy, Officer-in-Charge of Sports, followed by the National Anthem.

THE COIMBATORE INTERCOLLEGIATE COMPETITION

The Coimbatore Inter-Collegiate Dramatic Competition was conducted under the auspiceis of the Lions Club of Coimbatore on the 28th and 29th of November 1964 in the Savitha Hall. The main object of holding this competition is to promote an interest among the young collegians in Indian art and culture.

Southern Forest Rangers College was also one among the six colleges in the city including the Nirmala College – the Champion for 1963.

Southern Forest Rangers College enacted a suspense thriller written and directed by Pradeep Mohanty, a student of this College with full stage technique. It was praised highly by the distinguished gathering and in a keen competition, this College came out successful and was and awarded the prize for the best actor — P. K. Mohanty and the prize for the best drama and best group performance which is a new record in the annals of Southern Forest Rangers College.

THE DRAMA IN SHORT:

James Williams, a lame artist gets the best prize for his painting captioned "The Eyes". All of a sudden Inspector Black appears for the detection of the murder of a David Ferdinands, a disciple of James Williams. Smith, another of James assistant comes to the picture in a drunken condition. Black had two suspects. One is Smith and the other is Cecil, a servant of James who had undergone imprisonment in connection with a murder. But as the drama developes, though bit melodramatic, the suspense condenses. And ultimately it was revealed by Smith that the real murderer of David Ferdinands is none other than James Williams, who has stolen the painting "The Eyes" and claimed the bestartist's reward.

'The Eyes' Group expresses its deepest gratitude to Sri T. C. Ramakrishna Officer-in-Charge of Dramatic & Cultural Association, Shri K. Shanmuganathan, M. A., A. I. F. C., for their kind help to make the drama a success. And it also extends its gratitude to the Ramakrishna Nursing Home for sparing the crutches which plays the principal role in the drama.

Participants in "The Eyes"–

On stage – P. K. Mohanty as James Williams
B. S. Meera Baba as Smith
D. S. Pateria as Cecil
K. G. R. Naidu as Inspector Black
B. P. Sharma as David (News Representative)
Satyanarayana Rao – Jack (Photographer)

Off stage – M. A. Khyoom – sound effect operation.

A scene from the drama " The Eyes "

Another scene from the "The Eyes"

Participants with Principal and Mrs. Peter.

The Role Played by our Forests in National and Rural Economy

SHRI B. JAGANNATHA SHETTY, B. A., L. L. B.,
Instructor, Southern Forest Rangers College.

NATURAL VEGETATION IN INDIA:

Natural vegetation over greater part of India is forest of one type or other. However by continued exploitation and maltreatment of plants for centuries by man and his domesticated animals the forest climaxes have been destroyed replacing them at places by grasslands, scrubs, Savannahas, Swamps, deserts and such other biotic or bioedaphic communities that may represent post climax, preclimax or subclimax stages (Puri). As an exception to this there is a school of thought which holds the grasslands of Nilgiris and Palnis represent climax vegetation (Ranganathan, 1938).

FOREST DEFINED:

The word is derived from the Latin word 'foris' meaning out of doors — and Chamber's 20th Century Dictionary defines forest as a large and uncultivated tract of land covered with trees and underwood. In the British Commonwealth Forest Terminology — forest is defined as a plant community predominantly of trres and other woods vegetation usually with a closed canopy. This definiton can be said to have a Botanical basis.

According to the definition given in the Indian Forest Records — Forest is an area set aside for production of timber and other forest produce and maintained under woody vegetation for certain indirect benefits which it provides e. g. climatic and protective. This definion has an Administrative baas. As for the definition from the legal point of view — in the Indian Forest Act VII of 1865, a forest was defined as land covered with trees brushwood or jungle, but this definition had to be dropped in the Act as subsequently amended — as it was found to be

inadequate and there is no statutory definition of Forest as such at present. The scope of the Indian or State Forest Act extends to the various categories of forests like the Reserve Forests, Protected and Village Forest – which are lands declared as such by the Government – according to prescribed procedure. Hence legal concept of the forest does not take into account the nature of the growth into account. Even a bare area containing no vegetation can be a forest in the legal sense sometimes – if such area has been selected for afforestation or other purposes and declared as one or the other category of forests mentioned above. From the *ecological point* of view forest is a biological unit, consisting of an active living community. It is not a mere aggregation of trees like so many stones in a field. As Kostler puts it " There can be no forest until a social organization comes into existence. To this social organization, to this living community belongs, not only trees but also innumerable living organisms from the plantworld – Shrubs, Herbs, mossess, lichens, algae, fungi, bacteria, from the animal kingdom – mammals, birds, insects, worms and protozoa. The third of the Natural Kingdom has its place in the soil and bed rock of the forests". In the forest, two very powerfu principles of nature viz. struggle for existence and mutual aid is very much in existence. That out of the millions of seedlings only a few develop into majestic trees can be taken as proof of the keen competition, whereas mutual aid manifests itself in the micro-organisms of the soil.

VALUE OF FORESTS:

" Forest is a peculiar organism of unlimited kindness and benevolence that makes no demands for its sustenance and extends protection to all beings offering shade even to axeman who destroys it ".

'Gautama Buddha'

It is a fact of History that life of man and development of civilization had been profoundly influenced by the presence or absence of Forests or their relative abundance or scarcity. Z-on (1920) recognizes 3 distinct stages in the relation of human progress to forests,

(i) Civilization dominated by forests,

(ii) Civilization overcoming forests and

(iii) Civilization dominating forests.

He shows that as the stone, bronze and iron ages existed at the same time on the earth, so also 3 stages in the relation of forests to mankind are present simultaneously. In Central Africa and parts of Central and South America, the forests are still dominating civilization. In much of North America and Asia-civilization is overcoming forests and the forests in Europe and parts of United States of America are dominated by man.

The benefits that accrue to mankind from the forests can be grouped under 2 broad categories viz. Indirect and Direct.

The indirect benefits can be conveniently further subdivided under the heads 'Protective, climatie, Aesthetic, and Hygenic', Direct benefits are mostly economic and social.

INDIRECT BENEFITS :

(a) **Protective value :** Forests in general and those occuring in special situations like the catchment areas of river systems, fringes of deserts, coastal belts river banks and other erodible areas particularly help a great deal in preserving the physical features of the country in the following ways.

Forests conserve the soil :

Soil is defined as the uppermost weathered layer of the 'earth's' crust together with the remains of the plants and animals that live on it and in it. As the medium for plantgrowth soil is the basis for all life on this earth, and hence constitutes one of our richest treasures. Further it is the result of the labour of Nature for thousands of years. But this soil especially if it is light and friable and when found on steep hillslopes is exposed to the risk of getting washed away due to falling rain, running water, or blowing wind — if the area is bare of vegetation. In forested areas the tree growth presents 3 lines of defence against the falling rain — firstly by the interception by the canopy which prevents the rain drops from reaching the ground with a thud and disturbing the soil, secondly by the leaf litter and humus occuring on the floor of the forest acting as a sponge and absorbing the water reaching the ground without allowing it to run off in torrents carrying the topsoil with it and thirdly by the vast net work of roots beneath the surface holding the soil together. In the words of

Sri M. D. Chaturvedi, a former Inspector General of Forests, the challenge of the millions of drops of water can be met effectively only by the myriads of leaves which a forest canopy bears.

Forests also reduce by checking wind velocirt, erosion due to wind — which is a big problem in vast plains containing friable soil. It has been estimated that 123 million out of the 274 million acres of cultivated areas are affected by erosion and if this is restored our annual production of foodgrains will increase by 10 million tons. This is a piece of vital statistics — in view of the perpetual food crisis — our country has been facing.

Under the 5 year plans almost all our important rivers have been harrassed for irrigation or power at enormous cost. If erosion is permitted to take place in the catchment areas due to denudation it will lead to silting up of the reservior and thereby reduce its capacity and endanger the life of the dam itself in the long run.

Forests conserve moisture:

Forest vegetation by reducing the surface run off increases the amout of water that percolates into the soil, Forest soil with its overlying organic layers is in a real sense a vast sponge capable of absorbing much more water than in the open area. It has been estimated that forest humus is capable of absorbing 2 to 4 times its weight of water. Greater depth of Soil found in a forest and the larger number of pores in the soil due to the penetrating action of the roots — have also the effect of increasing the absorption of water. Further, water loss due to evaporation is also reduced due to

(i) Lower wind velocity

(ii) Decrease in temperature

(iii) greater relative humidity

(iv) the litter and other cover over the mineral soil present under forested conditions. As against this, loss of water due to transpiration which is specially high during growing season has to be considered.

However even after making allowance for the loss due to the last mentioned source, in the net balance, the sum total of the effects of having a forest cover is to conserve a great deal more moisture than in a bare area, In the words of

Sri K. M. Munshi, a former Minister of Government of India, "Tree means water, water means bread and bread is life. If we are to survive, our philosophy of life must be rewritten; not in words, ideas or achievements but in terms which would replant us firmly in the earth and under the shady tree".

Forests feed our springs:

Part of the water that percolates into the soil at higher elevations reappears as springs lower down. A forest by reducing surface run off and increasing percolation — ensures a large supply of ground water to feed our springs this being specially true in mountainous and hilly regions. There are numerous instances on record where springs dried up or decreased their flow perceptibly after deforestation — and reappeared after reafforestation.

Forests regulate streamflow and prevent floods:

In the case of denuded areas surface run off takes place not only to a greater extent but also more rapidly compared to forested situations. This resutls in the streams and rivers during heavy rains receiving too big a supply of water for a brief period followed by long period of abnormally low or no flow. If the discharge of water during peak rainy days is in excess of the carrying capacity of the streams or rivers, we get floods — leaving behind a trail of disaster — which has become frequent though tragic phenomenon in our country. On the other hand under forested conditions there is skilful husbanding of this precious life giving water which for the most part is stored underground as a prudent man's money in a bank — for steady and useful spending later on. The story of the water falling on a denuded area can be likened to the squandering of a fortune by the prodigal in record quick time not only to no purpose but to evil purpose.

Forests prevent shifting of sand by checking wind velocity:

In special situations like the coastal belts and desert fringes, wind blows over vast expanses of water or sand without any let or hindrance and gathers momentum in the process. These strong winds easily lift the friable soil like the sea, river or the desert sand, carry them and deposit them in the fertile fields of the interior which are laid waste in the process. It has been observed that the

Rajaputana desert has been spreading over a 100 mile front at the rate of half a mile annually towards the fertile plains of Uttarpradesh. Hence 50 square miles of fertile plains is swallowed up by the desert every year. The strong winds that develop in the region during the summer transport vast quantities of salt from the sea and Rann of Cutch, whipping up the desert to terrific dust storms, the fury of which is felt throughout northern India.

Strong winds are also capable of shifting erodible soil elsewhere also i. e. other than the costal belts and desert fringes. Winds also do a lot of mechanical injury to standing crops and other property. A barricade of trees is the best bulwork to protect our fields, orchards, nurseries, buildings and livestock aganist wind.

Forests prevent damage due to Avalanches :

In Alpine regions, the forest is an important factor in preventing the damage due to avalanches. Avalanches which are moving blocks of ice or snow which, cause lot of damage to property enroute-have been found to be of more frequent occurence in bare slopes rather than in forested hills.

(b) **INFLUENCE ON CLIMATE :**

Influence of Forests on Temperature :

Forest vegetation tends to make the climate of a locality more equable i. e. less hot in summer and less cold in winter. The forests have also the effect of reducing the daily range of temperature by lowering the daily maximum and increasing the daily minimum. The effect is similar to the one due to the proxmity of an area to the sea. This is attributable to the greater humidity of the atmosphere surrounding Forest canopy due to transpiration.

Influence of Forests on Preciptation :

The influence of forests on the extent of qrecipitation has been the subject of controversy. It has not been conclusively proved that Forests increase rainfall. The weight of evidence from the experiments conducted in Bavaria tends to show – as far as local precipitation is concerned, forests do exercise a favourable influence, probably by presenting a cooler surface to the rain laden clouds and facilitating

quicker condensation. Here again the effect is said to be more in higher altitudes than lower altitudes. Regarding general precipitation also balance of evidence tends to show that there is more scope for clouds to be formed due to evaporation of transpired and other moisture in a forested area, just as it happens over the sea, and the clouds so formed will fall as rain at a greater or lesser distance depending on the direction of the prevailing winds a configuration of the ground.

Influence of Forest on Air currents :

A strongly blowing wind exerts a desiccating effect in thc region in that it accelerates the process of evaporation and transpiration. The presence of the forests serve to reduce wind velocity and thereby prevent possible reduction in atmospheric humidity.

(c) **AESTHETIC VALUE OF FORESTS :**

From the aesthetic angle, forests have much to offer to man. There is much material in the forest to gratify man's sense of the beautiful whether it be flowers with their rich fragrance, leaves of many hues sparkling streams or the colourful birds and animals that roam its lengths and breadths. The presence of the forest endows the otherwise dull and dreary landscape with a beauty and grandeur all its own. As Shakespeare has put it, in the forest one can find tongues in trees, books in running brooks, sermons in stones and wisdom in everything.

SANITARY INFLUENCE OF FORESTS :

Parks and Forests are ideal places for healthy relaxation and recreation – by which one can get refreshed in body and mind. Atmosphere in the vicinity of forests is comparatively free from dust and smoke and rich in oxygen content thanks to the process of photosynthesis. The most harmful contents of dust are spores of pathogenic bacteria and fungi, and decaying organic matter. The amount of air drawn into mans' lungs is estimated to be 20 – 30 pounds daily. If it is not a dust free atmosphere — the dust particles containing the spores of pathogenic bacteria and fungi come into contact with moist portions of the lungs and cause diseases.

There are many waterborne diseases due to microbes living in the soil finding its way to streams and rivers along with surface water. There is less scope for this to happen in forested areas. Further, water from a well forested watershed is relatively clearer and free from dirt. Hence water coming from the forested area is the best for drinking and cooking purposes. There is growing appreciation of this fact by Municipal Water Departments.

Forests also serve to prevent the spread of epidemic diseases by acting as effective barriers.

DIRECT BENEFITS :

Wood the most important of the forest products is also the most commonly used commodity in every day life of civilized people of the world — in home and office, school and college. Man is surrounded by articles made of wood from the cradle to the coffin. Early man obtained almost everything from the forest, food, housing, clohing, fire, tools and other equipment and weapons. Wood is a universal raw material and can yield (i) power (Firewood, woodgas and wood alcohol) (ii) food (cattle fodder, wood sugar) (iii) clothing (rayon and staple fibre) (iv) living and transport (Houses, railway carriers, car bodies) (v) Packing (packing cases and teachests) (vi) Engineering goods like machine parts and (vii) Educational equipment like paper, books etc.

On the national plane forests are important as the source of supply of timber for defence, communications and construction and raw materials for many of our important industries.

FORESTS AND DEFENCE :

The Second World War disclosed the unsuspected degree to which our country's Defence depended on her Forest Resources. The forests play an important part in the building up of our Army, Navy and Air Force, the three main branches of our Defence set-up. The wood that is used for planes and ships, weapon parts and ammunition boxes, truck bodies and buildings comes from the forests. During the last war, that our more valuable forests had to be subjected to overfelling, to be able to meet the mounting needs of war testifies to this fact and these war scars have not fully healed yet in many of these forests.

FORESTS AND COMMUNICATIONS:

Forests also play their part in the maintenance of the network of railway crisscrossing the country which are her life lines especially during an emergency. Wood is used for laying tracks and building coaches. Wood is likewise used for building up of our merchant navy, civil airlines and extension of telegraphic and telephone facilities to more remote parts of the country.

FORESTS AND INDUSTRIES:

The supply of raw materials to many of our important industries has to come from the forests as detailed below.

Match Industry:

The match Industry was established in the country in 1922. 60% of the country's requirements are made from factories numbering in all 225 and the rest from Cottage Industry localised in Shivakasi of Ramanathapuram Distriat estimated to employ about 50,000 persons. The annual consumption of wood by the Industry is 1,40,000 tons now and it is expected to rise to 2,50,000 tons by 1975. About 25 different species are currently being used the commonest amongst which are Salamalia malabaricum. Ailanthis excelsa, Ailanthis malabaricum, Evodia lunaankenda (roxburghi), Spondias mangifera, Alstonia scholaris, Symplocos spicata and Trewia mudiflora. The Government collect an annual revenue of Rs. 20 crores from this Industry.

Firewood and charcoal

Firewood and charcoal are required for both domestic and industrial purposes. In our country 95% of the fuel wood produced is used for cooking & heating purposes and it forms 92% of the total wood produced. The corresponding figure for Central Europe is 19% which is in striking contrast. The total quantity of fuel produced in the country is 9·5 million tons.

Plywood:

The first Plywood factory in the country was started in 1923-'24 prior to which annual import of firewood used to be to the tune of Rs. 90 lakks. Now there are 71 factories distributed all over the country of which 34 are in West Bengal, 16 in Assam and 14 in Kerala. The total quantity of plywood manufactured rose

from 53·82 million square ft in 1950–51 to 15'72 million square ft in 1959 and this upward trend is continuing. Following are the more commonly used timbers in the plywood industry (i) Salamalia malabaricum, Dalbergia latifolia, Mangifers indica, Veteria indica, Cedrela toona, Dysoxylum malabaricum and Tectona-grandis.

Paper :

Paper was first made in India during the Moghul period, though the Chinese are said to have discovered it as early as 105 A. D. The first mill was installed in the country in 1870 and the Industry had to face many ups and downs. As in 1961 there were 28 Paper Mills, 97 Board Mills (78 of which are in Bengal) with annual capacity of 4,10,000 and 77,000 tons respectively. There is only one Newsprint Mill in Madhya Pradesh with an annual capacity of 30,000 tons. The main raw materials used are Bamboo Sabai grass, Eucalyptus, Wattle & Pines. Boswellia Serrata is used for making newsprint in Nepa Mills. The demand for paper is bound to increase rapidly in the future, with the spread of literacy, and rise in the standard of living of our people. F. A. O. (Food and Agriculture Organisation of the U. N.) experts have estimated that our country's annual requirements are likely to rise to 8,25,000 tons by 1972.

Rayon and staple Fibre Industry :

This is closely allied to the Paper Industry. Though of recent origin, it is bound to expand rapidly in future because as at present for every 100 persons inhabiting this earth 14 are fully naked and 30 half naked and there are ambitions schemes to harress the Textile fibre Industry for covering this nakedness. Domestic production in 1956 was to the order of 17,000 tons.

Apart from bamboos, E. Grandis, E. globulus and Wattle are considered suitable woods for Rayon manufacture.

Sports goods Industry :

This is located mostly in Punjab and Kashmir, and Rs. One crore worth of wood is used annually in this industry. Hockey sticks, Tennis Badmintion and Cricket bats are the Sports Articles manufactured. Morces albo and Kashmir willo. (Salix alba and S. fragilis) being the speciel used.

Textile auxillarios :

Wood worth about Rs. 3½ crores is used in this Industry annually. Adina cardifolia and Mitragyna Parviflora being the most commonly used species for making bobbins.

Other industries for which raw material supply is from the forests are :

(a) **Tanning :** Annual production of tanning in the country is 20,000 tons.

(b) **Lac :** It is the main cash crop of Adivas's and sheduled trcibes and it earns for the country an annual export revenue of about Rs. 10 crores.

(c) **Katha and cutch :** Rs. 2 to 3 crore worth of Katha and cutch is produced annually in the country.

(d) Resin

(e) Essential oils

(f) Mathematical Instruments

(g) Automobile, ect.

Minor, Forest Produce :

In addition to the above the forests yield a host ot Minor Forest Products like Bamboos, canes, grasses, fibres and flosses. Tans & Dyes, gums, resins and oleoresins, splces, essential oils. Horns, skins, hides wax and other animal products.

Forests and Employment :

About 8 million persons are employed in Forest work - 6 million persons directly and 2 millions indirectly in the Forest based Industries.

Role of Forests in Rural Economy of our country :

India is a country of farmers as 75% of hea 450 million people live on the forms in the 5 lakhs of villages distributed all over the country. If the country is to progress, the farmer has to prosper. For the farmer to prosper he must be able to get better yield out of the land and protect the same. Forests can help the farmer to help himself in this regard in many ways as detailed below.

(1) The success of crow more Food Campaign depends on the success of Crow More Wood Campaign. At present the farmer in his need and ignorance burns the farmyardfield. It has been estimated that the cowdung burnt as fuel in the country annually would be the equivalent of 4½ million tons of ammonium sulphate and 2½ million tons of phosphate fertilizers - which if used in the field would have yielded an extra 9 million tons of food grains. As a former Inspector

General of Forests has remarked, we are in a way cooking rice with rice and wheat. This colossal loss of fertilizer shas been estimated to be on a par with the loss that would result from burning up 12 Sindris. One rare method of breaking the existing bad sequence of poor soil- poor farmer- poor country is to have adequate extent of forest to meed. the fuel needs of the villagers.

(2) The forest can also supply small timber and bamboo for the construction of dwelling houses and agricultural implements. The conditions of living of the farmer and the condition of the farm implements have their undoubted effects on farmyield.

(3) Forests can provide fodder and grazing facilities for his cattle. Healthier cattle enable deeper ploughing to be done which has very salutary effect on crop yield.

(4) The farmer can get thorns and other fencing materials for fencing to protect his crop.

(5) Agriculture being a seasonal occupation, the farmers are under employed duriug the slack seasons. During such periods they can be profitably engaged in forest based cottage industries like basket making, toy making. pencil making etc. and enabled to increase their earnings.

In addition to the above, indirect beneficial influences of the forests in moderating climate, conserving soil and moisture reducing descication and damage due to wind also operate on the rural scene — apart from their aesthetic and recrational value.

CONCLUSION:

In conclusion, I wish to reproduce below Sri K. M. Munshi's admirable summing up on the value of our forests.

" There is a balance on earth between air, water, soil and plant. Trees have a great place in the economy of Nature. They hold up the mountains, cushion the rain and storms. They discipline the rivers, they control the floods; they maintain the springs; they break the winds; they foster they birds; they keep the air cool and clean; they are the guardians of the perennial springs of water; they are the natural defenders against dust storms, they prevent the erosion by wind and water; the preserve the fertility of the soil; they provide the fuel in order that we may live warm and protected; they pravide the timber resources for our railway system; they provide paper, plywood, bobbin, matchetc. They make our hydro-electric schemes possible; they give us the oils and the gums and the herbs, honey and lac — so essential for man's life on earth".

The Pea Cock Paavo Cristatus our National Bird *

B. JAGANNATH SHETTY,
Instructor, Southern Forest Rangers College.

'A thing of beauty is a joy for ever' wrote Keats. If there were to be a beauty contest open to all the creatures of the World there is little doubt that the pea-cock will get the Crown, 'Proud as a pea-cock' if a familiar enough phrase coined by man. We think it is proud because it is beautiful just as we would feel proud if we were beautiful, whether in reality or in imagination as is sometimes the case. The bird itself is probably unaware of its beauty and incapable of pride. Unlike in the case of human beings, its beauty, is intoxicating to the beholder and probably not to the holder.

The pea-cock has many feathers to its cap both literally and metaphorically. Lord Subramannia son of Shiva is a chip of the old block. If the high Himalayas are the abodes of the father the son has his dwelling places on hill tops in the south. Dear reader, perhaps you know too well that Vellingiri is one such hill top-halloed by his stay. The nature God whereever he sits is a big draw. He seems to sit on high altitudes on purpose, so that the splendour of the hills may be revealed to the numerous devotees that make a bee line up the winding tortuous paths to the top especially during the festival seasons. This God is very near to us foresters if at all we are near to any God. The choice of the pea-cock as his mount is a tribute to the bird as well as a further proof of our mutual affinity. The association of the God with the bird has cast a religious halo around it and made it quite respectable. The bird is with us from today and it is hoped with it the 'Lord' also.

Man has to imitate the God and the story of the pea-cock throne is a fact of history. When foreigners visit India almost the first thing they ask for is the fan made out of pea-cock feathers.

* Appeared in the Wild Life Journal S. F. R. C. 1963.

The latest honour done to the bird is its adoption as the National Bird of India. Hence there is particular appropriateness in introducing the bird to our college estate where conditions are conducive to its growth and development.

A few details regarding the description, distribution, etc., of the bird are furnished below:

COCKS AND HENS:

Cocks have the long ornamental train running to a length of 3′ to 4′ which the hens lack. Both are crested but the crest of the hen is less conspicuous. In effect the cock is more beautiful than the hen as is the case with most of the species of birds. What about men and women? One may ask. The women and men respectively have to answer. The answer may be biassed - but this bias is the basis of life itself. Reverting to the bird - it is polygamous - one cock has a harem of 4 to 5 hens. In courting - cocks display before a bevy of hens erecting and fanning out its showy train, strutting and posturing to the accompaniments of paroxysms of quivering.

DISTRIBUTION:

Found throughout the Indian Union - sometimes upto 5000′ elevation in the Himalayas, Ceylon and East Pakistan. In Burma it is replaced by the species Pavo muticus - with a pointed crest.

HABIT:

Inhabits dense scrub and deciduous jungle plains and foot hills - and prefers neighbourhoods of rivers and streams.

FOOD:

Consists of grain vegetable shoots, insects, lizards, snakes, etc.

CALL:

A loud and harsh scream - punctuated by rapid shrieks 6 - 8 in number, with a vertical pump like movement of the head and neck.

NESTING:

Season January to October. Nest consists of a scrape in the ground in dense thicket reinforced with sticks and leaves.

Know the Birds in the College Estate*

SRI H. RAJAGOPAL SHETTY,
Assistant Instructor.

We are rather fortunate that our college estate has got a fairly rich collection of birds. With the expansion of the city, trees, groves, and small forests in the surrounding area were gradually cleared, and buildings or fields came up in its place. For the last 50 years or more, during which period the city expanded rapidly, this college estate must have afforded refuge for a large variety of displaced birds in the neighbourhood. Befitting the hallowed institution that is housed within, this college estate has served as a veritable sanctuary of birds, in the precincts of city.

The list of the birds often seen here is given below. It is roughly in the order of frequency they are seen. By no means it is exhaustive, and it is probable that there are a few more species which are not noticed and hence included in the list :

COMMON MYNA (Acridotheres tristis) :

Perhaps it is the commonest among the birds here. It is dark brown and black in colour: A white patch below the wing is conspicuous only in flight. Its bright yellow bill and the bare skin, around the eye is the distinguishing factor from its close cousin — jungle Myna. Seen around the college in groups often by the side of play ground. In the evening, they may be seen returning from west in flocks of 4 to 10 over the play ground from the adjoining fields outside the estate.

WHITE HEADED BABBLER (Turdoides Striatus Affinis) :

A common bird mostly seen hopping on the ground or sitting in low branches, mostly along Principal's Road or Northern Road. They are always seen in groups of 5 to 7; therefore its popular name "Seven Sisters" ("*Sath Bhai*"). Like ladies they are very noisy as if quarreling among themselves.

* Appeared in the Wild Life Journal S. F. R. C. 1963.

In fact they are most united and co-operative. While building the nest, all the members assist. When a dog or any other common danger comes, all join together in pursuing it with shrill abusive calls.

Its creamy white head and untidy sticking-out feathers of grey and brown colour are its distinguishing features.

INDIAN KOEL (Cuculus Scolopaceus):

Often seen around students club, and around the college buildings hidden in the thick foilage of trees. Male is glistening black like corw, but slightlhy slimmer, with longer tail. The female is brown, spotted and barred with white all over. In the month of May and June, the whole college estate will be reverberating with the melodius call Kuvoo - Kuvoo - Kuvoo; but not so frequently in other months.

Often these birds are seen being chased by crows from tree to tree. It is very shy, and avoids stare of people.

Have you noted the earliest caller in the morning? If it happens to stay near about, its call can be heard as the first rays of light are seen in the east.

JUNGLE CROW (Corvus culminatus):

There are two types of crows in this estate and both types can be seen concentrated near students. The jungle crow is jet black throughout. It is slightly bigger in size than the house crow, specially the head. The feathers look slightly ruffled.

HOUSE CROW (Corvus splendens):

Concentration is around students mess. Distinguished from the jungle crow by the greyish neck, well groomed feather, and slightly slender form.

It is of the size of a pigeon, often seen in pairs around play ground. Early in the morning they are often seen in quite a large number, as if in conference, on a single tree close to the college building. Distinguished by its glossy light and dark blue wing, with reddish brown breast and back. They are noisy mostly in the morning and evenings at times in the moonlight nights. It's call varies, but is harsh and grave in every from.

DRONGO OR KING CROW (Dicrurus Macrocercus):

While returning form the games in the evening, nobody can miss these birds sitting in pairs or groups of three to six on electric wires around the college. They are most active during the evening hours. Glossy black, scissor tailed, with a minute white dot below the eye in line with the beaks. He is an expert flier, can swoop, twist turn, glide and dart with closed wings with marvellous skill. Though hardly 1/6th the size of a crow it can strafe a crow or any other predatory birds with the ease of a supersonic fighter jet, chasing a heavy bomber.

RED VENTED BULBUL (Molpastes cafer).

Seen around the museum, students hostel, etc. It is bigger than the house-sparrow but smaller than the Myna. Its head is black with a small crest. Its identifying mark is a red patch below the tail at the root (near the vent). A very active singing bird, popular among people from the earliest times.

HOOPOE (Upupa Epops):

Seen often close to the ground along the northern and western road. It has got a conspicuous yellow black and yellow hood of feathers, and is similarly barred with black and white on the wings, back, and tail. It was found building a nest on the roof of Museum some months back. It is noted for its untidy nest.

TREE PIE (Dendrocitta vagabunda):

Slightly smaller and slimmer than the Koel, with bright chest-nut, white and brown colours, preferring leafy branches of trees. It often glides with wide spread wings before the perch. Noted predator of eggs and young ones of other birds. it is graceful to watch.

SPARROW HAWK (Accipiter nisus):

This is very much like a female Koel, but more agile. Flies close to the ground from low over-hanging branches chasing small birds, frogs, lizards, chameleon and mostly squirrels — squirrels start calling in horror, when they sight this bird. Often seen around the college' very brave, tolerates inquisitive watcher to approach quite close. It is said to be a migrator of long distances.

COMMON WOOD SHRIKE (Tephrodornis prondicerianus) ;

Slightly bigger than a house sparrow seen hopping about the trees in twos or in small parties. Its identification is easy, if you can mark a dark stripe about the eye, somewhat elongated, like the appiication of eye-tex by a sophisticated lady. Above this dark strip is a contrast:ng white strip. Tail feathers are black, flanked with white feathers, visible clearly during the flight.

PARIAH KITE (Milvus migrans) :

This is perhaps the biggest bird within the College estate. Uniformly dark brown in colour, with slightly forked tail, can be often seen feeding on carcass. In the early morning and evening hours, it has been noticed near the sports pavlion. It is likely some are living in that area in the jungle. Generally they nest in tall trees.

SPOTTED OWLET (Athene brama) :

A small bird, slightly bigger than a house sparrow; can be seen in pairs active in twilight close to Principal's bungalow on the northern road. It has a greyish brown colour with white spots all over. Usually seen glaring at the people passing-by but does not stand being stared at.

SUN BIRD (Cinnyris minima) :

The smallest bird in the estate, mostly seen in pairs, hopping from tree to tree in search of flowers for nectar. It has a slender long curved bill, a dark shining green (almost black) forehead, neck and breast and a yellow abdomen. The female looks different. It is greyish green above and has a yellow abdomen and is much less showy. Makes a "Chik-chik" sound both in flight and in peach, and looks almost restless. Makes a characteristic loop in flight due to alternate flapping of wings and gliding with closed wings.

COPPERSMITH OR CRIMSON BREASTED BARBET (Megalaima haemacephala) :

This is a brightly coloured bird of the size of a sparrow green in colour, with bright crimson breast and forehead, and yellow throat and under parts. Seen in pairs on trees in search of fruits and small insects in the barks. Very

attractive in colour, but not numerous. Makes a monotonous "tuk-tuk" sound, repeated at regular intervals of about one second, resembling the hammering sound of a distant copper-smith.

LARGE GREEN BEE-EATER (Merops suqerciliosus):

Seen in the vicinity of the big bee hive in the north eastern corner of the college building. Easily distinguished by the wiry extension of the central tail feathers, conspicuous in flight. It is of the size of Bulbul, mostly blue in colour with black stripe through the eyes, yellow and reddish brown breast, neck, and crown.

The Vanquished Giants *

K. SHANMUGANATHAN, M. A., A. I. F. C.,
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It was a long, long time ago that the earth formed itself as a separate entity of the Solar system. Geologists estimate the age of the earth as anything from 2,000 to 10,000 million years. Though scanty remains of certain sponges and sea-weeds are reported to have been observed in geological formations of the Pre-Cambrian eras, direct evidences of life, as expressed in the presence of abundant fossils, are seen only in the rocks of the Cambrian systems, which are reported to be about 500 million years old. Bulk of these fossils are, naturally those of invertebrates - the lowest and earliest form of life over the earth's history.

The fishes appeared in the Devonian period (about 320 million years ago) followed by the Amphibians and primitive plants during the Carboniferous and Permian periods (280 to 220 million years ago). While the entire history of the earth since its formation is of interest to the Geologist, the Botanist and Zoologists are interested only since the dawn of the Cambrian period, from when, the life on the earth began to unfold itself with later developments to suit the changing conditions of the habitat. The entire processes involved in the developments in life from the time the smallest of the Protozoans appeared till the present day, is referred to as "Evolution". The first reported general theory on evolution was enunciated by Chevalier de Lamarch in the beginning of the nineteenth century, though the one that went into elaborate details and detailed research and the first to gain general acceptance by the scientific experts, was that propounded by Charles Darwin in 1859. There are indications, however, that the concept of "Evolution" existed long before this, though not with such clarity and wide acceptance. Our own ancient literature and Mythology contain quite a few interesting references to this – the best of them being "*Dasa Avatars*" of Lord Vishnu. The Lord appeared first as a fish in "*Matsayavatar*", followed by the

* Appeared in the Wild Life Journal S. F. R. C. 1964.

" *Koormavatar* "– turtle – an amphibian. He is depicted next in the "*Varahavatar*" – a mammal. As " *Narasimhavatar* " the Lord took the form of half animal and half man. The first of the human being, a midget, is the " *Vamanavatar* ". As Shri Parasurama, He is depicted as an ordinary human being with all human failings and shortcomings and perhaps from this stage, the spiritual development of the human brain is given the emphasis, as in the next avatar as " Rama ". He represents a perfect man while the subsequent *avatars* (viz.) Balaram and Krishna, depict Him in human forms but with extraordinary supernatural powers. The next, the last *avatar* (*kalki*) will be when He comes to announce the end of the world.

Thus, evolution represents the various stages of life-animal and plant life — since the formation of earth. Many animals had existed in this world some for short periods, geologically, and some had a longer span of existence and a few like some of the Protozoans had lived right through the pages of the earth's life history.

For one who is in quest of knowledge of " Wild Life " as the term is taken to mean in general and Forestry parlance today, the time from the Permian period, when the Amphibian appeared on the face of the earth, should be of speciai values. Since its formation, the earth had had many " Ice Ages " or periods of " Glaciations ". These glaciation led to many periodical changes in topography, climate, composition of the atmosphere, Sun's radiation effects, etc., all of which interrupted and controlled to a more or less extent, the existence and type of vegetative as well as animal life on the earth.

The early amphibians. like their successors of today, lived in marshes and ponds and laid eggs in water which hatched into tadpoles. But unlike the existing ones, these ancient amphibians attained large sizes. They lived on insects and grew accustomed to living on land. Some grew to great lengths, upto 10 to 15 feet. Among them were the "*Eryops*", "*Seymonia*", *Limnocellis*", etc.

These amphibians lived for about 50 million years, in a moist warm world with adequate vegetation which provided them with food. They wandered about freely with no fear of attack by any one and obviously well-contented with their lot.

Then came a change. The marshes dried as a result of the change in in climate, the waters receded in extent and a period of glaciation followed. Some of the amphibians went back to water and many stayed on land (such as the "*Dimetrodon*" "*Sphenocodon*", etc.) to continue the chain of evolution to the reptiles that followed to dominate the Mesozoic era. The span of the rule of the amphibians was about 50 million years, The reptiles apppeared in the Triassic period of the Mezozoic Era, dominated right through the Jurassic and Cretaceous periods. This Golden age of "reptiledominance" extended over 100 million years. As a result of "glacial recedence", the warm waters of the seas invaded the lands and made them a paradise for these animals to live. Places which are under premanent snow now,ıwere warm those days and tropical vegetation existed in such places with abundant luxuriance. The giant herbivorous dinosaurs revelled under such conditions and held sway for a considerable period of time. The biggest of this type was the "*Brontosaurus*" with a length of over ,70 feet and tipping the scales at 40 tons — about- 15 times the weight of a full grown Indian elephant of the present day. These had a long, low uncouth figure with a small head on a long neck towering high but with an exceedingly small brain weighing about 2 ozs. Then there was the "*Triceratops*" possessing three horns growing out of a bone that covered the skull. which was seven feet long. (This somewhat resembled the rhinoceros of today).

These monsters, had their worries, when the '. *Tyrannosaurus rex*" appeared. This was perhaps, the most terrible carnivore that had roamed about the face of the earth till date. He was well over fity feet in length and 18 to 20 feet high with rows of 6 inch teeth with a knife edge that could out through and crunch even the heavy armour worn by some of the vegetarian dinosaurs. Its hind legs had a three-toed taloned feet. Some of the dinosaurs strode on two feet while many were on four feet.

The climate changed again and fresh glaciations set in. The swamps ceased to exist and as a result of the consequent changes in vegetation, the vegetarian Dinosaurs had little to feed upon and with the antagonistic climate, they disappeared. Their carnivorus counter-parts began to vanish too, for want of prey. But the humbler and smaller of the reptilia survived as they were more adaptible and helped in continuing the line of succession to the reptiles of the present day. It is worthy of mention that the "*Pteranadon*" one of the first fliers to appear on the earth, came into existence during this period, with a wing spread of our twenty-five feet. The first bird ',*Archaeopterx*", also existed during thes pieriod.

The age of the mammals dawned even as the dusk was setting into the golden rule of the dinosaurs that had existed for over one hundred million years. At this transition period, the giant dinosaurs were still holding sway and continued to remain a big force to reckon with. But, facts record that the giants disappeared while the mammals despite their dis-advantages in size, strength and power not not only survived but also replaced them on the land. The main contributory factors for this were that the mammals

1. were warmblooded and hence could maintain their body temperature constant despite the changes in atmospheric temperature ;
2. gave birth to young ones and hence there was less damage due to pilferage and breakage as in the case of eggs of reptiles ;
3. could teach their young ones and train them to collect their prey and defend themselves against their enemies ;
4. had big brains, while compared with the amphibians and reptiles ;

and

5. were comparatively of smaller sizes and hence swifter than the giant reptiles.

The early mammals appeared along with an abundance of flowering plants in about 75 million years ago during the early Eocene period. The mammals of the present day include the giant "Blue whale" which may weigh as much as 100 tons as well as the smallest of the mice. But in general the early mammals were much bigger than their successors of today. In fact, quite a lot of them were gigantic in structure. They had to, as they were to fight the colossal dinosaurs in their struggle for existence and survival, midget though they were, while compared with the reptiles of the age preceeding them, that roamed about the wilds those days. We are able to have authenticated informations about their existence thanks to the rocks, the marshes and the ice which have preserved their skeltons and other remains as fossils. Among the early herbivorous mammals were *Tetraclaendon* and *Micclaenus* (small creatures resembling a mixture of horse and cat). Then came the hoofed vegetarian *Pantolàmbda* and *Barylambda*. The *Metacheiromy* was the forefather of the present day Pangolins. The monkeys of the day were Nothanctus and Tetonius. Small squirrel like *Paramys* set in and

developed into the rodents of the latter ages. *Eohippus* an ungulate, about 2 feet high was the first of the horses. (There was a giant running bird towering to well over 7′ in height – the *Diatryma*.)

During the Oligocene period, the *Brontops*, a large horned and hoofed animal, existed. This was a herbivorous animal, about 12 to 15 feet in length. The rabbit also made its appearance along with the early dogs and cats. Among the cats were the *Hoplophoneus* a cunning but peaceful predator with retractile claws and sabre teeth. The *Bothidon*, the first, perhaps, of the hippos and an ancestor of the camel *Poebrotherium* also existed at this time. With the advent of the Pleistocene period a fresh set of animals made their appearance. These animals included the *Mastodons*, a huge elephant-like but much larger animal with giant sized jaws with six-inch long fangs that could stab the victims to death and teeth which could tear them to ribbons and crunch the bones through. Even the *Mastodons* were in fear of attack by the *Smilodon* a sabre-toothed tiger, much heavier and bigger and more ferocious than the biggest of the "Royal Bengal tigers" of today. Then, there was the giant bison — *Bison Crassicornis*. The woolly Mammoth, a forerunner of the present elephant, lived among glaciers. It was intensively covered with woolly hairs, possessed recurved tusks and stood well over 10′ in height. The *Megatherium* a giant sloth bear, weighed more than 3 to 4 tons and stood to a height of 20 feet, when it reared up on its hind legs. Most of the giants of this age also went the way of the giant dinosaurs perishing and disappearing as a result of the many climatic changes that came in. The earliest of the *Homo sapiens* (man) appeared during this period, about a million years ago. The modern man has been on the earth for about 25,000 years only. Man with more brain than brawn. has also played his part in the processes of Evolution in his own way. A well-developed brain has led on to better adaptibility, capability, learning and achievements but it has also brought about destructive abnormalities in the form of cunningness, avarice, jealousy and crookedness. He succeeded in successfully domesticating many animals such as the dog, pig, cattle, horse, fowl, goose elephants, etc., etc. The initial attempts of domestication were often efforts to utilize these animals for certain kinds of work and in turn man gave these animals a comfortable living accompanied in many cases with almost religious reverence. But as time rolled by, he began to convert some of them into food. With absolutely selfish motives – to get more land for him to live, to get more food and for the so-called pleasure of hunting (yet another evidence of man's crooked

thinking), he started invading the domains of the other animals and has wrought havoc among the animals and has badly distorted the generally smooth processes of Evolution. Thus "The great danger of today is not a new Ice Age, but the activities of the arch-mammal, Man himself", It may perhaps be, that this uncontrolled and unwise activities of destruction of man are, by themselves a link in the chain of evolution, leading to the disappearance of Man and the advent of a new species that will rule the earth's domain in future. We can only hope that the change-over will not be painful to man as it was to the *Brontosaurus* when the *Tyranno-saurus* succeeded them!

ACKNOWLEDGEMENTS :

1. "The World we live in"=A Life Publication.
2. "Do you know about Reptiles and Amphibians"- Collins Pageant of Knowledge Series.
3. "Do you know about animals" - Collins Pageant of Knowledge Series.

Wild Dogs and how they Hunt*

SUDHAKAR R. ROHI,
1962—'64 Course.

The name Wild Dog may lead one to suppose that this species is related to the domestic dog. But in fact it has no share in the evolution of the domestic dog. Also there is still diversity of opinion as to whether the domestic dog is descended from wolf or not. There are certain characteristics common while some marked differences also. The wild dog differs from all members of the genus *Canis* in many respects though it looks like a red village dog. The wild dog has only thirty teeth while the domestic dog possesses thirtytwo teeth. The domestic dog is more allied to jackal than to wild dog.

The wild dogs roam, hunt, through the land, in a pack of three to thirty. The damage caused to other games by this pestiferous species is far more than that caused by any other carnivorous animal. They are found practically all over India and are popularly known as the dholes. Its African counterpart the African hunting dog, *Lycaon pictus* is one of the most interesting and wonderful animals. There is no predatory animal in Africa responsible for so much disturbance of game as this hunting dog. In proportion to this number there is none which deals out such a wholesale destruction. In India also wild dogs are most destructive of other species of wild life.

Hunting dogs are mainly diurnal animals, in as much as the greater part of their hunting takes place between the first streak of dawn and first hour after sunrise and again from about an hour before sunset until dark. If there is moonlight then they enjoy night hunting too! They show a wonderful type of team work while hunting. Lt. Col. J. Stivenson — Hamilton, late Warden of the Kruger National Park, explain their manner of hunting. He writies, "Few beasts display more sagacity in pursuit of prey than the wild dogs". By the way he adds further explanation. "Watch a pack of them in grey morning

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light as they quarter the bush in quest of some unsuspecting herd. They ramble along at hounds pace, each individual with head and tail held low, and in perfect silence — silence which by any way, is seldom broken throughout the hunt. On coming on a fresh "line" there is no increase in pace, but leaders prick their great round ears, and jump at intervals straight up and down to get a view over the top of the grass and low shrubs. Now some antelope can be seen down an aisle of the bush calmly browsing and immediately the whole pack spreads out noiselessy to encircle it. Antelope raising his head quickly in an interval of feeding, catches the sight of one of the sinister forms stealing from, bush to bush. He snorts loudly and in a moment as by the impluse the pack dashes in. Away in all directions and in the extremity of terror rush the antelopes, springing high in air and in confusion often impeding one another in their frantic efforts to escape. One or two are instantly brought down, and rest of the pursuers, splitting up into small detachment, relentlessly pursue the unfortunate individuals, which they have singled out. There is rarely any escape".

The wild dogs are gifted with marvellous speed for short distances and with immense endurance where chase is long. However, even fleet-footed animals can not easily run away from a pack of wild dogs. They follow the trail of the animals that has run far ahead, by scent, and keep on following till they come up with the tired prey and then pull it down. The wild dog pulls down the quarry by tearing open the stomach. The sharp teeth easily penetrate the stretched skin of the prey. They are very fast eaters. In a very shortwhile nothing remains of it but the bones for much flesh is needed to satisfy the hungry stomachs of the pack. One of the reasons why wild dogs are so terrible foes to the game lies in their wasteful method of hunting. Two or three individuals kill an antelope and eat as much as they can, leaving behind the rest and again on the way the new prey is sought. The usual prey of these voracious creatures consists of mostly antelopes and animals of the deer family. But they also kill other big games. Even leopard recognizes dangerous enemies in a pack of hunting dogs; and seeks refuge in a tree on their approach. There are too many hard-biting mounts all-round! Hunting dog live entirely on the animals which, they have killed themselves. Naturally as the game increases, the wild dog will tend to become numerous, unless the efforts are made to keep their number down. When the wild dogs are more in number, they do not hesitate to attack even the lion. On the other hand, lions infrequently kill and eat the dogs. The hunting dogs are most ferocious and fearless. They are very tough and hardy and will go long distances

even when severely wounded. In spite of the fact that they are expert swimmers. the witd dogs avoid to cross deep waters even when hot on the heels of their quarry.

Indian wild dog — dhole is also found in other parts of Asia. In appearance it differs slightly from the African one. In addition to the African and Indian wild dogs there are several other breeds of wild and half wild and half domes ic ated dogs. Most of them resemble the wolf in their long wooly hair and up right ears. The wild dog of Australia, known as Dingo is closely related to pariah of India. Dingo never barks. The Eskimo dogs found throughout most of the Arctic regions howl like wolves but do not bark. Even when taken young, the wild dogs are not easily tamed.

Although wild dogs, when present in large numbers, are a scourage to the game, killing, terrifying and scattering all over the country and included in the vermin list, there is a school of thought gaining ground of late in Africa that the wild dogs also play an useful role in nature's economy. Whether the view is sound or not will depend on the local cir-cumstances. In many places Government rewards for killing the wild dog. The wild dog has been called the most destructive hunter in the jungle-a description that would be true if we leave out man!

A Study of Bird Migration*

— A. K. THARU,
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No resident of India who is moderately observant can fail to notice the great influx of birds during the months from September to November or to remark about their abundance during winter in a place where none were to be seen a couple of months ago. The species eagerly sought after by the man with the gun — the snipe, duck, geese and cranes — together with a host of smaller fry that interests him less or none at all like the sandpipers, leaf warblers, larks and pipits. Though the transformation is magical enough to be felt by all, it is hard to find at least five persons in a hundred whoever stop to ask themselves the question what brings this about or how. To the man in the street, the birds come at this season simply because, it is the nature and the things that they should. Whence they come is none of his concern while how or why they do it is the bird's own affair !

Yet, the subject of migration is one of the most enthralling branches in the study of bird life. The magnitude of their movements and the regularity and orderliness of their occurrences are no whit less astonishing than the cycle of season and have aroused the wonderment of man through the ages. The Red Indian of the far countries actually named their calender months after arrival of the migrant birds. A scientific and realistic study has now helped to dispel some of the fanciful notions connected with it while it must be admitted that many of the phenomena involved continue to remain a mystery and are unlikely to emerge from the realm of speculation.

Landsborough Thomson, an eminent authority describes bird migration as "changes of habit at periodically recurring and alternating in direction which tend to secure a optimum environmental condition. Many theories have been put forward to explain this. A consideration of the various theories to explain

* Adjudged as the best essay in the competition open to all City Colleges in 1964.

this "Raciacustom" of bird migration would be here out of place. The advantages of migration to birds is self-evident. The absence from high latitude during winter enables (a) avoidance of cold and stormy climate, (b) avoidance of short day light in search of food, (c) avoidance of those conditions that bring about the scarcity of supply such as freezing of water and snow enshrouding the ground. On the other hand the advantages of high latitude during summer are (a) availability of good and uncongested nesting territories, (b) availability of long day light hours for search of food when food is most required for the young (c) availability of abundant food supply and that is possible after the luxuriant growth of spring vegetation.

Bird migration is itself clouded in mystery. Many spectacular feats are attributed to the migrant birds. The swallow that breeds in the British Isles and as far north as the Arctic, winters in South Africa. The flock of starling that is commonly found in the British fields are drawn from Russia and other Baltic countries vastly augmenting the number of British native starlings which oddly enough do not migrate to the south but spend winter in the isle itself. Some of the most common shore birds like the Dunlin and Sanderling which breed in the Tundra of Northen Europe fly over Central Europe on their way to Patagonia and Newzealand. The North American Golden Plover flies direct from the Artic to South America — a non-stop flight of two thousand miles right across the Atlantic — while the birds of the same species that live in the Pacific coast fly a even greater distance from Alaska to their wintering grounds in Hawaii. Even the tiny Ruby throated Humming bird flies right across the Gulf of Mexico, a flight of five hundred miles. The longest known migratory journey is performed twice each year by the Arctic Tern which flies from the Arctic winter south, right across the world to the Antartic summer and back again — a distance of 11'000/- miles each way !

These flights makes us wonder how these tiny way farers are able to traverse such tremendous distances and return so accurately to their homes that they do this is certain, for many of the birds have been marked by aluminium bands on their legs (popularly known as 'ringing' the birds) and they return to the same place year after year and build nests close to the ones of the previous year. It has also been shown that many winter in the same place year after year. Recently a ringed grey wag tail found its way, presumably from the Himalaya to a particular lawn in a Bombay subrub — no bigger than a badminton court — in the second week of September for five years running !

Many birds migrate in large flocks sometimes composed of several species to their winter homes. A vast majority of them migrate during the night, some both at night and day while others only in day time. The latter for the most parts are birds that find their food in the open and feed as they travel like the king bird, robin, etc. such other birds like the swallow, warblers and markbird, which find their food in the seclusion of trees in dense vegetation migrate entirely at night. Along with this, are such other birds like the duck, geese and cranes which move at night and the calls by which they keep one another's company are the only indication of their passing. It is interesting to note how they avoid the hills, tree and buildings on their way. Even more astonishing is the way by which the young ones migrate quite independently of their parents and find their way without any form of guidance from one end of the earth to the other.

The advantages of migrating at night can be best under stood by the following illustration. When migrating birds arrive at large bodies of water where they can find nothing feed before starting and by the time they reach the other side, it would be dark and impossible to feed. Thus a period of more than a day would elapse — a period that might end disastrously for many birds because of their high rate of metabolism. On the other hand if after feeding they migrate by night and they will reach the other side before day-light and they can once again glean their living. During these night migrations birds are attracted by any steady bright light and every year thousands dash themselves to death against light houses, tall monuments and high buildings.

Often they are overtaken by storms and their plumage becomes soaked they are beaten down to the waves and droed. Often thousands of birds are killed in a single storm. Of course, the vast majority of them sweep on and reach thair destination in safety.

With birds that travel great distances, it is often interesting to assess their general rate of advance. While birds fly non-stop flights of great ditances as the fall flights of turnstone from Alaska to Hawaii or that or the Golden Plover from Labradore to Northern South America, do not progress far in a single flight. The spring advance of Robin is for example only 13 miles a day in Southern Canada, 52 miles per day by the time it reaches central Canada and the maximum 70 miles per day in Alaska· It should not be inferred from this that the Robin travels 13 or

the maximum 70 miles in a day. Probably they fly hundred or two hundred miles in a single day but after each flight they dally about the nesting place and this brings down the general rate of their advance.

The speed and height at which the birds travel are rather difficult to find except that of the homing pigeon which can be turned from one place to another or that of the duck and geese whose conspicuous flock that fly over towns a and cities can easily be followed. The championship speed for a homing pigeon is found to be 55 m. p. h. A blue heron has been timed by amotorcyclist flying directly below it at 36. m. p. h. It has been shown that geese migrate at the rate of 44.4 m. p. h. while a flock of duck at 47.8 m. p. h. The speed of smaller birds are usually less.

Mention must also be made of altitudinal migration which is particularly marked among the species that live in the mountains. High elevation birds are forced to descend in winter due to the exigencies of weather and the descending snow-line. But with the coming of spring, the snow melts and the snow line recedes up-wards, they reascend to breed in higher hills. This is not only confined to high elevation birds but is also indulged in sometimes by birds living in lower altitudes.

The recording of the facts of migration by the marking of individual birds is a very fascinating study. It is possible to know something about migration – the height and speed at which the birds travel, the weather and the wind they prefer, etc. Much is already known about the matter and also about the astonishing ability of birds to find their way home perhaps from hundreds of miles away and from a district which neither they nor any of their kind had seen. But the more information that is gathered, the less possible does it seem to account for the why and how of it all. Scientists are never likely to know all about this and the men will continue to wonder at the migrant birds as they had done from the days of Jeremiah.

And so if we step out in a cloudy night when the birds are migrating, hearing their sounds only faintly resembling their day time calls, we can picture to ourselves, the thousands of winged travellers returning from a sojourn in the tropics, pushing their way through the dark night, guided by an innate sense to their homes.

We can also think of the past ages and especially of the ice age when these creatures were pushed to the south, returning when the glacier receded only to be forced back once more with the coming winter. Then with the withdrawal of ice and evolution of the seasons, the migration by repetition through the ages became a fixed thing and with the ensuing modification in the contours of the continent and the location of food supply many variations developed in the migratory route of each species which seem inexplicable today.

Yes, man has got a lot to learn from Nature. Every object of Nature, whether it in sea, air or land has got a lesson for every individual. Shakespeare must have had this fact in mind when he wrote of finding "tongues in trees, books in the running brooks, sermons in stones and good in everything".

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OBITUARY

J. N. RAMASWAMY
(Mysore State)

It is with deep regret that we record the sudden demise on 28th March 1964 of Sri J. N. Ramaswamy of the Mysore state, a student of the 1959–61 batch of this college, under tragic circumstances. Tragic circumstances they were, as he chose to put an end to his life himself and cut short what would certainly have been a glorious career in, for and by the Mysore Forest Department. His parting message to his friends as scribbled by him on the top of the rocky precipice in the evergreens of Agumbe, from which he chose to jump deep down to end his life, was "*Mens Sano In Corpore Sano*" what drove him to this unfortunate decision nobody knows but he chose it as He willed it.

Born on 2–12–1936, Shri J. N. Ramaswamy went through a brilliant academic career, obtaining his B. Sc. degree from the Central College, Bangalore. He joined the Sonthern Forest Rangers College on 11–11–1959. He was a good student evincing keen interest in his studies in the lecture room as well as out on the field. He associated himself actively with the various dramatic activities in the college. With his charming personality, unassuming nature and pleasant manners he endeared himself to all who came in contact with him. A good cricketer, he was a medium pace bowler and a merry wielder of the willow. None realized that his last innings would be so disastrously early.

We offer our deepest sympathies to his aged parents and share with them this great and calamitous loss

Of thee we mourn:
to Thee we pray.

THE SOUTHERN FOREST RANGERS COLLEGE MAGAZINE

ANNUAL JOURNAL OF FORESTRY, SHIKAR AND TRAVEL

The Magazine now forms a section of the Southern Forest Rangers College Association. The Editorial Board has been reconstituted and the Management Rules revised in terms of the Rules of the Association.

EDITORIAL BOARD

Chairman : Shri M. B. Peter, B. SC. (MAS.), B. SC. (FOR EDIN.), Principal.
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Secretary : Shri J. N. Pandey.
Business Superintendent : Miss Rachel. G. Ittyerah, B. SC., Dip. Museo.

MANAGEMENT RULES:

1. **Life Membership**: Rs. 200/- or more.

2. **Subscription:** Subscriptions shall be for a year from November to October as follows :—

For Officers drawing a salary of Rs. 100/- and above Rs. 4/- per annum.
Less than Rs. 100/-, Rs 3/- per annum.

The Editorial Board is authorised to revise the rate of subscription from time to time. The subscription should be sent in advance or paid by Bank's Order system to the Joint Editor, Southern Forest Rangers College Magazine, R. S. Puram P. O, Coimbatore-2.

Ordinarily the Editor will inform the members three months before the expiry of the subscription. If no intimation is received by him regarding continuation or otherwise of the membership, the November issue will be sent by V. P. P.

Correspondence: Correspondence regarding subscription, advertisement and other financial matters should be addressed to the Editor, Southern Forest Rangers College Magazine. R. S. Puram P. O., Coimbatore - 2.

4. **Contribution of Article**: Contributions should be sent to the Editor.

5. The Editor will not be responsible for the opinions expressed in articles other than the Editorial. The Editorial may not be the opinion of the Editorial Board.

6. Articles connected directly or indirectly with forestry will be accepted. Articles on other subjects can be considered according to their untility and the space available.

Articles should be legibly written in ink or preferebly typed with double spacing on one side of foolscap page, leaving a margin of $1\frac{1}{2}$ inches, and be **accompanied by summaries.**

Contributors are requested to sign their contributions and clearly state their name, place of residence and occupation.

7. **Reprints:** Contributors can be supplied free of cost TWELVE reprints of their articles together with any illustrations, provided the articles are two pages or more in length and the Editor is informed. Contributors desiring extra copies should intimate the Editor the number of copies required. They will be charged the actual expenditure incurred on them.

8. **Payment**: No payment will be made for contributions to the Southern Forest Rangers College Magazine.

9. **Free Membership**: The Magazine offers free membership of ONE YEAR ONLY, to any contributor, other than the students of the Southern Forest Rangers College, who contributes the largest number of accepted articles to the Southern Forest Rangers College Magazine.

10. **Prizes**: The following prizes will be awarded annually to the students of the Southern Forest Rangers College :—

(a) for the best articles adjudged by a special committee constituted for this purpose, published in the Magazine.

(b) for the best largest number of articles published in the Magazine.

The Special Committee shall consist of:

(i) The President, F. R. I. and Colleges, Dehra Dun, (ii) The Principal, Southern Forest Rangers College, Coimbatore and (iii) The Editor, Southern Forest Rangers College Magazine.

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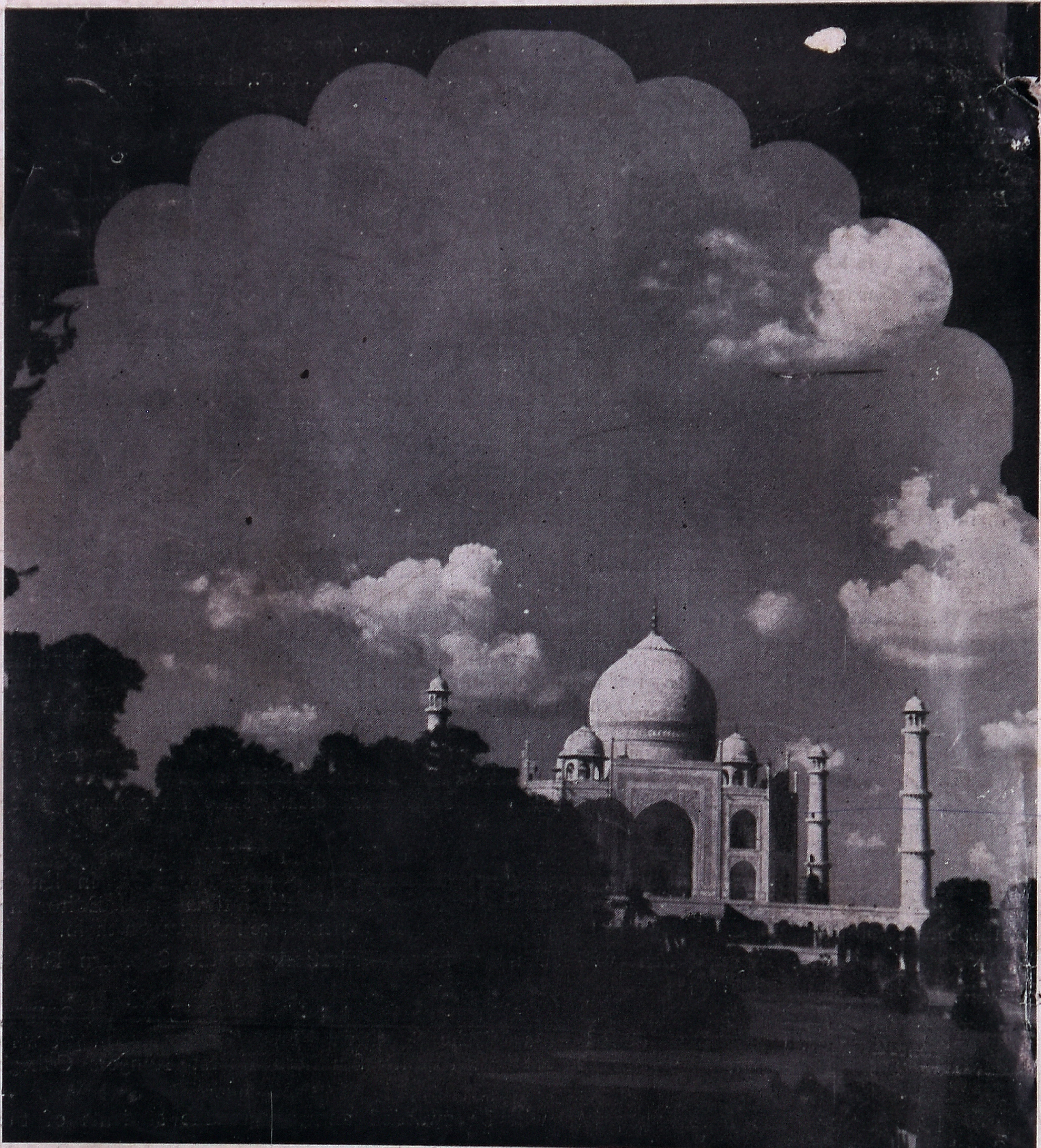

— *Arsal.*

Edited by S. Kondas, Honorary Editor, The Southern Forest Rangers College Magazine (Instructor, Southern Forest Rangers College). Published by M. B. Peter, Principal, Southern Forest Rangers College Coimbatore - 2 and Printed at Sukumar Printers by C. P. Ethirajulu, Joint Editor V. Rangamani.